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Electrical Publicity

WITHOUT reflecting in any way upon the value to industry of the work done by the British Electrical Development Association, one may say that we have gradually come to regard the speeches delivered at the annual luncheon in London, as not mattering very much from the electrical development standpoint.

As is not unusual we found journalists present who inquired, "What is this organisation and what does it do?" It occurs to us that it might not be wasted time and effort if a little folder were prepared for newspaper men indicating in general terms what sort of people are its members and provide it with funds, also what are the general objects and aims that we have in view. Such a folder might be sent with the invitation.

It is complained that the newspaper Press contains ridiculous statements regarding electricity and electrical matters. We do not remember a time when it was otherwise. E.D.A. has certainly not proved to be the remedy for that sort of thing and from what we have seen it does not often get on the heels of erratic and fantastic reports. Possibly many of the inaccuracies are of such a nature as to seem to the technical mind hardly worth correcting.

It is many years since it was first suggested here that important newspapers should have an electrical adviser attached to their staff; the old retort that there was not work enough to justify such an addition would hardly apply with the same justice to-day when electrical affairs have become so important a part of our national industries and when electrical manufacturers (and E.D.A. itself) have become substantial contributors to newspaper revenues.

The more effective work of E.D.A. on its propaganda side is the preparation and distribution of suitable informative or educative material rather than the correction of mis-statements though, of course, the latter duty has its place—in reason. But the absence of knowledge regarding E.D.A. itself inclines us to think that there is sense in the suggestion of a member that the Association should advertise itself more than it does. The suggestion that members of electricity committees should be provided with copies of the very exhaustive annual report will probably be acted upon to good advantage. There must be many electricity authorities who do not know what they are missing by remaining unattached. How to approach and convince these is one of E.D.A.'s established problems; a copy of the report of a year's work would be an excellent introduction.

The burden of work that has been so unstintingly and successfully borne by Mr. C. D. Taite, as chairman of the Executive Council, has been heavy during the past year. While it saw an end to a period of some difficulty it brought with it important arrangements connected with the work of internal reorganisation. From the particulars which we reproduce from the report on page 469 of the E.D.A. Staff Organisation as it exists to-day, it will be seen that certain new appointments have been made and from a statement made at the meeting last Friday it appears that the appointment of an industrial power adviser or assistant may be made before long, thus completing the organisation for present purposes. But E.D.A.'s duties are not stationary; they may be added to from time to time as changes bring new needs and especially if the industry decides to hold a large electrical exhibition.

Bearing in mind the valuable equipment which E.D.A. now has available for helping the entire electricity supply industry it is a matter for regret that the membership still only comprises from 60 to 70 per cent. of the undertakings. There was an addition of 23 members on balance during 1936 but 100 per cent. as Mr. Taite remarked must be our objective. That is a perfectly sound policy, however sceptical we may be regarding the likelihood of its attainment, until some material changes take place in electricity supply organisation.

The Nerve Centre

Speaking at the E.D.A. luncheon of the essential contribution made by electricity towards national defence, Sir T. Inskip described the grid as providing an indispensable reservoir of power. In his tentative suggestion that switchboards and vulnerable machinery might be made bomb-proof he was far nearer the mark than those who fear that overhead lines, so difficult to see from above, would be destroyed by aircraft (more damage is likely to be done to underground cables by a chance bomb). A generating station, on the other hand, does provide a prominent mark, but to make it bomb-proof would be difficult. If a generating station were wrecked, duplicate supplies for the local load could be given from other stations *via* the grid. This assumes that the switchgear is laid out with such an emergency in view, as it should be to meet normal civil requirements, and also that it and the grid connections are protected against aerial attack. If the latter precaution were to be adopted, the work should be carried out as part of the rearmament programme and not at the cost of the electrical industry.

Parallel Operation

The regional areas of the grid are normally operated as separate systems, but one day last November six of them were run in synchronism for several hours. This, in all its implications, seems to be the most striking of the many interesting technical features contained in the report of the Central Electricity Board for 1936. A maximum simultaneous demand of 4,218,000 kW was supplied by 112 selected stations and 45 others, which is believed to be the greatest number ever connected in parallel. The feat has been repeated during the past fortnight, we are informed, again without difficulty in synchronising or control. How close the governing of interconnected systems can be is shown by the combined load curve of the various regional areas on Armistice Day, when 1,500,000 kW was dropped from a total of 3,600,000 kW and picked up again within a few minutes with a frequency deviation in the worst case of only 0.35 of a cycle on 50 cycles. While the practicability of operating the grid as a single system has been demonstrated as an emergency measure, the programme of power-station extensions (which has to be worked out nearly four years ahead) indicates that each area will still be regarded as an independent system with regard to the margin of spare plant required.

Grid Finance

From time to time the financial position of the Central Electricity Board forms the subject of investors' discussions. They wish to know whether the Board will be able to stand on its own feet within the allotted time. An answer to this question is contained in the Board's latest report. In this, reference is made to the various loans which it has issued and the periods over which interest may be paid out of capital. In respect of the earliest issue (4 per cent. 1959-89) the power to pay interest out of capital ceased at December 31st last, while on the next four classes interest may be paid out of capital up to various dates ending in December, 1939. The Board found it possible, however, to allocate £1,131,516 out of last year's revenue to the interest on the portions of these stocks devoted to general purposes. (Interest on the frequency-standardisation portion is met by a special levy on the industry.) As general trading only began in two areas in 1933, and in the other areas at later dates, the Board considers that to be able to charge interest to revenue so far in advance of its obligation is very satisfactory.

Coal Difficulties

A document issued by the Department of Scientific and Industrial Research gives particulars of coal from twenty-seven collieries in Notts and Derbyshire. Proximate analyses and total sulphur and calorific determinations have been carried out for 239 grades and ultimate analyses for selected cases (Fuel Research Survey Paper No. 37, Stationery Office, 2s. 6d.). This is part of a scheme for providing reliable data on British coal resources, which ought to be of considerable use to station engineers. Unfortunately, complaints have been numerous lately that undertakings are unable under the official coal-selling schemes to obtain adequate deliveries even of fuel contracted for, and it seems unlikely, unless some rearrangements are made, that they will be able to take advantage of the work of the Department, which is designed to enable them to specify the size and quality of coal most suitable in each case. The Central Electricity Board's report confirms that coal stocks have become depleted to such an extent as to cause anxiety, and details of refinements possible, as those indicated by the Department, are likely to be merely tantalising under present conditions.

"Free" Cookers

By instituting a scheme whereby consumers on its two-part tariff are to be supplied with "free" electric cookers the Finchley undertaking claims to have "made history." Section 42 of the Electricity (Supply) Act, 1926, provides that a charge for "electric lines, fittings, apparatus and appliances" may be included in the fixed charge of a two-part tariff subject to authorisation by Special Order or by an approval under Section 31 of the schedule to the Electric Lighting Clauses Act, 1899, or corresponding provision. Mr. C. R. Westlake, the borough electrical engineer of Finchley, says that the approval which he has obtained from the Minister of Transport is the first under Section 42 of the 1926 Act. A notable feature of the innovation is that it maintains without increase the existing two-part tariff, so that, in effect, all the consumers who are at present on this tariff receive an electric cooker, two aluminium saucepans, and a kettle without further charge.

Trade with China

Reference is made in *Eastern Engineering and Commerce* to the cordial welcome which Chinese banking and industrial leaders are according to Mr. W. M. Kirkpatrick, who recently arrived there to represent the British Export Credits Guarantee Department. Dr. P. W. Kuro, director of the Bureau of Foreign Trade in China, viewed Mr. Kirkpatrick's mission as a recognition of the fact that his country was on the eve of a great industrial and commercial expansion; also that British manufacturers were to be given more official assistance in the matter of extending long-term credits to purchasers of their goods, so that they might play an important part in China's development. So far as our electrical industry is concerned it is to be hoped that the increase in exports to China last month is the first fruit of this policy.

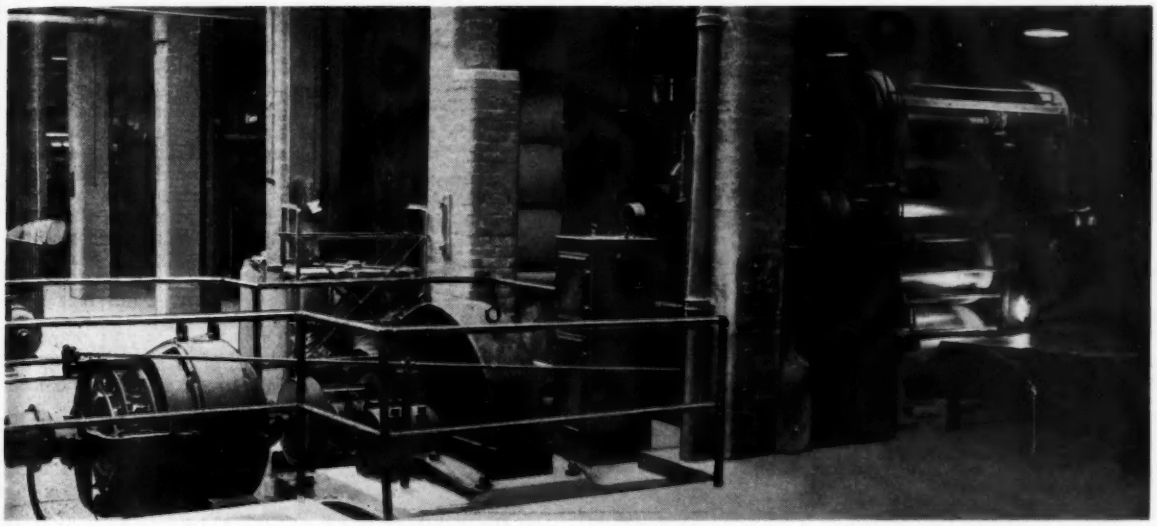
Reducing Fire Risks

A publication by the London Fire Brigade entitled "Fire Prevention Hints" (L.C.C., 3d.) contains a practical section on electricity. While this occupies only two pages out of a total of forty-two, the space is about proportionate to the risk, since the sixty-nine fatalities in London last year arising from personal accidents included four due to electricity, twenty-six to coal fires and ten to gas, while even the candle was responsible for eight deaths. Two of the electrical accidents were due to clothing coming into contact with heating apparatus, and under another heading is mentioned the legal obligation to guard against the possibility of this where children are concerned. The electrical section gives a concise summary of precautions with which every user should be acquainted, expressed in a way that is unlikely to scare him. Unfortunate happenings sometimes prove that they are not so obvious to the consumer as they are to the electrical man. The eleven hints offered include the opening of the main switch in emergency, the use of the right size of fuse wire, the inadvisability of using portable apparatus in the bathroom, the elimination of "compo" gas-piping and the need to have all work carried out by a competent electrician.

Rubber Manufacturing Processes

The part played by electricity in the Dunlop works, Manchester

ESTABLISHED in 1823 by Charles Macintosh & Co., Ltd., the works in Cambridge Street, Manchester, of the Dunlop Rubber Co., Ltd., is believed to be the oldest rubber factory in the world. To the electrical mind this has a special significance, and as we found for ourselves recently, by the courtesy of the Dunlop Rubber Co., Ltd., within such an old structure there is a thoroughly modern electrical installation. Further, this installation has grown up with the job continuously since the conversion from steam driving, so that it is an outstanding example of the flexibility and adaptability which are two of the principal characteristics of the electric drive.



Three-bowl calender with a.c. commutator drive [*Elec. Rev.* photo.

True, the factory has been extended enormously since it was first electrified, but the fact remains that the initial plant was completely steam driven and that in conversion and revision electricity has kept, and is keeping, operation continuously up to date. This has a closer meaning when it is realised that within the narrower purely engineering limits the steam drive was particularly suited to the majority of the plant, which carries very heavy loads and needs high starting torque and comparatively slow motion. Thus reduction gear is much in evidence, the average reduction being round about 500 to 50 r.p.m. There is a maximum connected power load of over 11,000 h.p., the vast majority of which is a.c., and a lighting load of something like 400 kW. The motors employed in the factory vary in size from less than 1 h.p. to 600 h.p.

Some of the raw rubber received from the company's plantations is in the form of crêpe, and this is thoroughly washed under water streams as it is passed continuously through rolls with fluted surfaces. In one instance four pairs of these rolls are group-driven by a 170-h.p. motor. The motor first drives, through a reduction gear, a common shaft, and then at each take-off from the shaft a second pinion reduction is provided.

600 h.p. synchronous motor for power-factor correction and mixer drive [*Elec. Rev.* photo.

Mastication is a fundamental and vital process in the manufacture of all commercial rubber from raw material in solid form. The operation consists of subjecting the rubber to a "chewing" action by passing it through rolls with the individual members running at different speeds. We saw a line of four 50-in. by 20-in. double-geared masticating machines driven by a 250-h.p. motor. With each of these mills is an escalator over which the rubber is passed at intervals during mastication for cooling. Each escalator has a separate 1-h.p. drive.

Masticated rubber with sulphur and other ingredients is then mixed, in some cases, in heavy mixing mills which operate on the friction-speed principle employed by the masticating machines. Some of these mixers have up to 100-in. rolls, which are water-cooled. A typical mixing-mill drive is a 250-h.p., slip-ring motor serving, through reduction gear, two 84-in. mills, while a special drive, which will be referred to later, is a 600-h.p. synchronous motor which drives a line of four 84-in. mills.

Further mixing is carried out in Bridge Banbury internal mixers, one of which is driven by a 250-h.p. motor, *via* reduction gear, while its two 84-in. sheeting mills have a similar drive.

Rubber leaves the mixing mills as thick sheet which, after treatment in warming mills, is served in plastic form to calenders—another heavy-duty class of equipment. Generally the product of the calendering department, uncured sheet rubber in various thicknesses, may be considered as raw material for the many departments engaged separately as practically self-contained factories in turning out various rubber products. But in one case, at any rate, the calender is essentially process equipment for a particular department. We refer to a four-bowl calender and auxiliary equipment engaged on rubber frictioning of cotton duck for conveyor and other belting, the material leaving the last pair of rolls as rubber-impregnated fabric.

Different classes of the product demand different calendering speeds, and so this machine is driven by a variable-speed 925-300-r.p.m. motor. Field regulation on the Ward Leonard principle governs the speed variation of this motor, a suitable motor-generator set being installed for the purpose. For warming the rubber before calendering this machine has two 100-in. by 27-in. warming mills driven by a 250-h.p. motor.

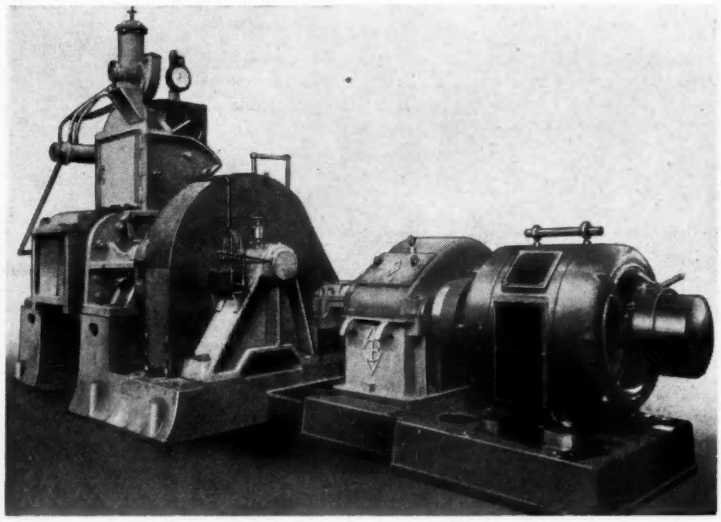
In the Belting Department we saw the impregnated material from this calender being plied up to required thickness on belt-making machines, having 35-h.p. motor drives.

The product from these machines is vulcanised in one of

several hydraulically operated steam heated presses approximately 32 ft. long by 6 ft. wide.

For rubber hose and various sections mixed material is extruded continuously, and to quote one example of the drives for this purpose a 50/17 h.p. 1,450/483 r.p.m. a.c. commutator motor serves a 4½-in. extruder and has mounted on its case a tiny motor chain-geared to the brush rocker. A 12-in. extruder engaged in producing solid tyre section rubber is driven by a 120/90-h.p. 550/330-r.p.m. d.c. motor.

In the hose department there are suggestions of cable manufacturing processes in connection with the braiding of the hose tube and particularly in the lead coating of the tube in a cable-type lead press. While the lead acts as "process equipment" in this case, producing the corrugations in hose, it also serves to protect the rubber surface during the subsequent vulcanising process. Finally, the lead is stripped from the hose.



Bridge Banbury mixer

Rubber rollers in many sizes are produced, but perhaps the most interesting equipments employed for this work are the special vulcanisers and lathes which deal with very heavy products for the textile and paper trades. A horizontal vulcaniser is 40 ft. long and 8 ft. dia., while we saw a lathe which is capable of grinding a 35 ft. by 5 ft. roll true over the whole face to within 1/2,000 in. Its main drive is a 15-h.p. motor with local push-button control. The smaller grinding lathe illustrated on page 461 has a 20-h.p. motor driving the grinding head and a 4-h.p. motor driving the roller spindle.

Curing is a fundamental and vital process to all rubber products. One surprise was to see the great number and variety of products that are moulded. Heat and pressure are applied in one operation. Hot-water bottles and automobile running-board mats are merely selections at random of the very many products of the common moulding and curing process.

But the unusual electrical application behind all this moulding work was found in the provision of the hydraulic supplies for operating the presses and other equipments throughout the works. A half-ton per sq. in. hydraulic supply is taken from the Manchester Corporation Hydraulic Power Department. Dunlop's, however, have found it economically sound to supplement this h.p. supply with l.p. supplies. High-pressure power is required only during the actual curing period, so that in many cases lifting the rams before this period is effected at lower pressure. A 300-lb. per sq. in. supply is provided by two Mather & Platt turbine pumps driven by 45-h.p. 3,000 r.p.m. motors, and a 175-lb. per sq. in. supply is provided by similar pumps with 25-h.p. drives. Another h.p. supply (¾ ton per sq. in.) is afforded by a horizontal three-throw pump with a 50-h.p. motor.

With one exception, the 175-lb. per sq. in. supply, each of the alternative systems operates in conjunction with an ordinary ram-type accumulator for creating head pressure. For the exception, however, a hydro-pneumatic storage system has been installed. The two motors serve, through a common pipe, a horizontal container filled partly with water and partly with air. In this way the practical compressibility of air is taken advantage of to maintain almost constant pressure in the tank, the pumps being automatically pressure-controlled.

On top of the control relay governing the Brookhirst switchgear is a pressure gauge, the pointer of which operates within two electrical contacts. The setting of one gauge is lower than that of the other. Thus the two motors are "on" together as little as possible, which helps to reduce the maximum demand. We were assured that to produce the same conditions of constant pressure with an ordinary accumulator system a pump of considerably increased capacity would be required. Communicating with the top or air portion of the storage tank is an air pump which is automatically controlled so as to provide make-up air against leakage when required.

Supplementing the water supply from the public mains, water is obtained from a bore-hole on site. This was discovered to exist in the search for additional water during the 1934 drought. The discovery of a large underground storage cavern communicating with three shafts created much excitement and makes an interesting story. Compressed air is conveyed to a depth of 400 ft. down the bore-hole, the air thus displacing water to the storage cavern. A 30-h.p. Harland Engineering vertical-spindle pump in one shaft lifts the water from the cavern to the works water system at a pressure of 80 lb. per sq. in. This includes a cooling circulation scheme in which here and there are spray coolers and small pumps which return the cooled water to roof tanks. Compressed air is used for many purposes other than water displacement, and a recently installed compressor has a capacity of 1,000 cu. ft. per hour at 100 lb. per sq. in. It is driven by a 200-h.p. motor.

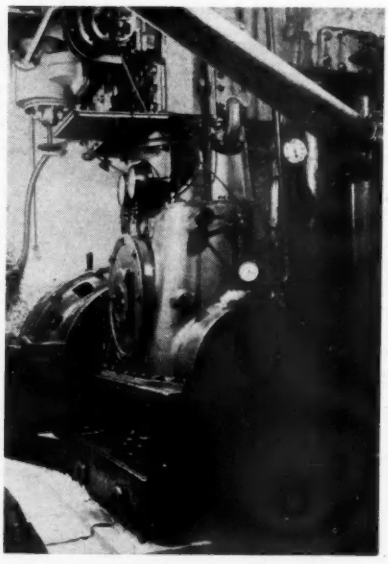
In another department mixed rubber is formed into a round block and frozen solid in a large refrigerating room served by ammonia-compressor equipment. From these frozen rolls the fine sheet is cut by rapidly oscillating knives under continuous water lubrication. The compressors and cutting machines are, of course, electrically driven.

Some products are manufactured direct from rubber latex. Outstanding examples of this are the new "Dunlopillo" products comprising mattresses, seat cushions, arm and back rests. The latex after preparation is cured in special hydraulically operated steam ovens and after washing and drying is ready for covering or any other finishing treatment.

Compressed air is used for transferring the latex from tank lorries to the storage tanks, but the greater electrical use in these processes is in connection with the high-speed stirrers.

The electro-deposition of rubber is an interesting process in which the vats and generating equipment look very similar to those employed in connection with metallic deposition.

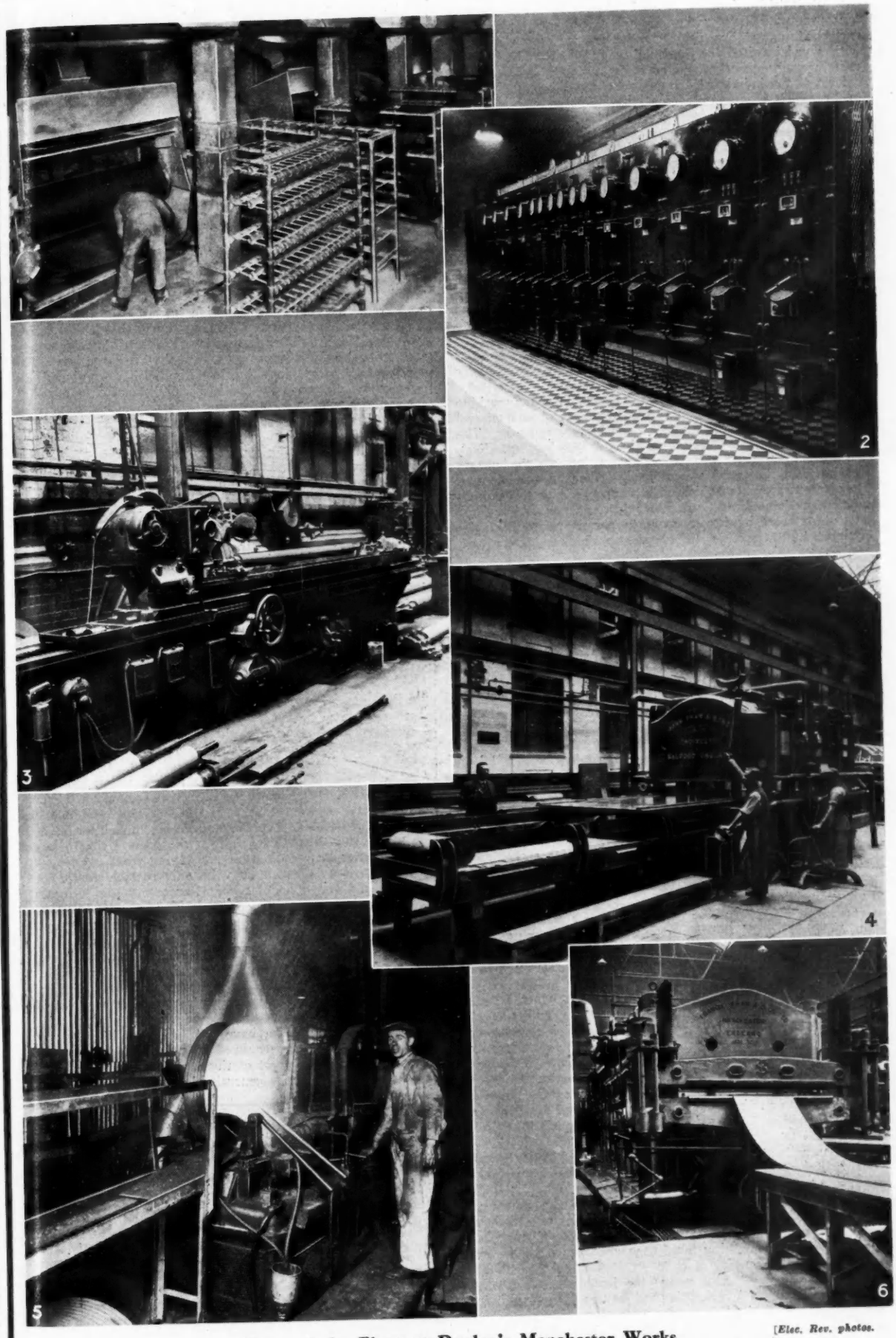
Among the electrical testing equipment in the laboratory is a 70,000-V transformer with tappings brought out to selective switches to provide various pressures for insulation tests on such products as insulating gloves and battery separator plates and boxes. In connection with the manufacture of macintoshes, for which naphtha is used as a mixing agent to permit spreading, recovery of the vaporised naphtha given off from the spread material is the duty of a special plant. Fans convey the vapour and air mixture through activated carbon in the plant cylinders. Steam is passed through the carbon and carries out with it the absorbed naphtha, and the mixture is finally separated in ordinary condensing equipment. The fans are the main users of electricity in this plant, the three units totalling 100 h.p.



[Elec. Rev. photo.

The 200-h.p. motor-driven compressor

Operating in conjunction with the extraction plant is a fresh-air inlet supply equipment to form a balanced system of ventilation. The air inlet plant which embraces air conditioning equipment employs a 30-h.p. high-speed motor and



Some of the Plant at Dunlop's Manchester Works [*Elec. Rev.* photos.

1. Line of 84-in. mills driven by a 600-h.p. motor. 2. 400-V distribution board in main sub-station. 3. Grinding lathe for rubber rolls. 4. Rubber tiling press. 5. Welding machine for solid tyre bands. 6. Large hydraulic press with steam-heated platens

"V" belt-driven fan. V belts, by the way, are an important product of the works, and we saw a girl building up such belts on a three-point "roller frame" on a machine with a pedal switch for the small motor drive. The built-up units are subsequently moulded and cured.

Most of the individual drives throughout the factory for up to, say, 25 h.p., employ squirrel-cage motors, while slip-ring induction motors are used for most of the larger straight drives. We saw a good many high-starting-torque motors of round about 35 h.p., while for variable-speed drives there are many a.c. commutator motors in sizes from 15 h.p. to 100 h.p. A few d.c. motors are still doing good variable-speed work, too. Among the different types of motors installed are representatives of most of the more important makes.

Air-break and oil-break direct-on-line starting switches are employed for all the smaller motors, while star-delta starters are used for all the slip-ring motor drives—in most cases oil-immersed Ellison & Brookhirst switchgear is much in evidence. With one exception, the 600-h.p. mixing-mill motor, all the motors are 400-V equipments. This large exception serves for power-factor correction and is supplied at 6,600 V direct from one of the two sub-stations from which separate supplies from the Manchester Corporation Electricity Department are obtained. This motor has a leading power factor of 0.65.

At the other supply point a 1,300-kVA synchronous machine performs a similar duty, apart from driving, of course, and floats directly across the mains on the low-voltage side. The average power factor of the whole load is 0.85 lagging. Each main sub-station has three 1,000-kVA transformers, the housing of which, in the latest sub-station, is worth a special note. They are in separate cubicles which open out to the switchboard room by up and down roller doors on one side and out on to the street by larger doors to permit removal of the equipment.

The three incoming panels and two of the feeder panels on the Ferguson Pailin switchboard in this sub-station are equipped with kWh meters. Considerable importance is attached to allocating the proper supply charges to the various departments, and the two metered feeder panels provide direct supplies to big users. Other big users are supplied and metered in a similar way in secondary sub-stations supplied from the main sub distribution board. Groups of smaller motors are supplied from the secondary "subs" in a similar way. The 105-V works lighting is supplied from 400/105-V single-phase transformers in the secondary "subs." Each main sub-station and its distribution system serve separately two district blocks of the factory divided by a street, but for emergency use the two "subs" are interconnected on the 400-V side. For the general factory lighting H.O. type industrial reflectors with pearl or clear lamps, for high or low mounting, respectively, are employed. In those departments where there are explosive vapours gas-tight double well glass lighting fittings are used.

A recently completed installation presented an unusual problem for the illumination of a lofty room in that it was desired to obtain high lighting intensities at reasonable cost without the monochromatic disadvantages of the discharge lamp. This was satisfactorily done by installing 500-W combined discharge and filament lamps with special dispersive fittings 55 ft. above floor level at 60 ft. spacing. Possible stroboscopic effect from the discharge lamp lighting has been overcome by connecting adjacent lamps in sequence on the different phases. The discharge lighting is supplemented by 750-W filament lighting units employing angle type reflectors and disposed on the walls at either side of the department at spacing intervals of 20 ft.

We are indebted to Mr. F. Walker, M.I.Mech.E., chief engineer and to his assistants Messrs. Unsworth and Hilton for their help in the preparation of this article.

Domestic Meter Sizes.

Major R. Amberton, M.I.E.E.

The case for a single rating for all supplies

DESPITE competition from the gas industry and other sources, it is an extremely backward electricity supply undertaking which is not at the present time increasing its output at a rapid rate. Where sensible tariffs are in operation the increase is much more rapid than where fear that a microscopic proportion of consumers may get electricity at too low a rate prevents the majority from swelling the profits of the undertaking.

The increased output is due to two causes, *viz.*, new consumers and increased use of electricity by old consumers. Whether a new consumer takes a supply merely for running a wireless set or for lighting a few lamps, it should surely be axiomatic by now that he is a potential user of electricity on a very much larger scale. It is also almost a postulate that a combination of economic and political considerations will compel all undertakings to introduce tariffs which will make it possible for their consumers to obtain electricity at a reasonable price. There are certain colliery districts where free coal will retard the use of electricity for cooking, and other exceptional cases apply, but, in general, it is unlikely that there will be any serious divergence of opinion upon this outline of the situation.

It would seem to be a natural corollary that when a new connection is made to the mains the service and size of meter installed should in all cases be of sufficient capacity to make it possible for the consumer to become electrically minded and to add to his installation without difficulty. Nevertheless, it is a fact that in many instances meters down to 2½-A capacity are still being installed. It is the purpose of this article to advocate a universal size of meter for domestic consumers—either 20 or 25 A; there is not much to choose between the two.

The reasons for this are that stocks are reduced to the lowest possible dimensions and meters never have to be changed because a consumer increases his load.

The technical reasons for selecting a 20- or 25-A meter as the standard size are: With the overload capacity of a modern meter (100 per cent. is guaranteed by practically all makers) it would require something more than an average all-electric house to tax the capacity of a 20- or 25-A meter capable of dealing with 40 to 50 A or more; the low-load performance of modern 20- and 25-A meters is good enough for the smallest load which the smallest consumer uses to any extent. The public is not going to confine its use of electricity to clocks or wireless eliminators for the purpose of contesting the validity of these arguments.

Many supply engineers have already adopted the policy of one size only and others are in the process of doing so, but there are a great many who think otherwise, for reasons that may be summarised as follows:—

1. The tariffs in use include a separate lighting tariff, and a 2½- or 5-A meter registers this load more scientifically than would a 20-A meter. 2. Certain consumers never will take more than a small lighting load. 3. A few consumers will find some way of getting a supply of a few watts free of charge, which would be wrong. 4. With only a few watts load a 20-A meter runs fast; this is unfair to the consumer. 5. It is more scientific to use a variety of sizes. 6. A consumer might discover that a 20-A meter has been installed when a 5- or 10-A size would have been big enough for his load. He might then dispute his bill on the ground that a larger size of meter has resulted in his having been overcharged. 7. The consumer's wiring may be only suitable for 5 A, so why put in a 20-A meter? It might encourage him to increase his load and cause trouble. 8. The mains are already severely taxed. The load could not be supplied if all consumers made effective use of 20-A meters, so why put them in?

All these objections to the use of a universal size of domestic meter have been put forward by supply engineers who have been consulted. I make no comment on them except to express the opinions that the advantages of simplification outweigh the objections; those undertakings which have standardised on one size have not had any difficulty; and in a few years' time the march of progress in electricity supply will have invalidated most of them, and for domestic supply one size only will be the general rule.

Measurement of Radio Interference

The British Standards Institution has published a specification relating to apparatus for the measurement of interference with the reception of broadcast radio transmissions, caused by electrical appliances. This document embodies the relevant agreed recommendations of the International Special Committee on Radio Interference (C.I.S.P.R.) of the International Electrotechnical Commission (I.E.C.) and the International Broadcasting Union (U.I.R.) as to the nature, essential characteristics and performance of an instrument for the measurement of interference. It further gives as an example a detailed description of the design and operation of a measuring set which adequately fulfils these requirements and has been found satisfactory in practice, both for the measurement of interference-producing voltages at the terminals of an appliance and also, when equipped with a suitable aerial, for the measurement of the intensity of interference-producing electric fields. Copies of this specification (No. 727-1937) may be obtained from the Publications Dept., British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

The Romance of the Power Companies

By Sir James Devonshire, K.B.E., M.I.E.E.

MY terms of reference for the writing of this article require me to use this title, but I do not intend to depart from historical fact although I may follow in some measure the romantic style in which it is to-day fashionable to write history. If romance means something bold and thrilling then there was certainly a good deal of the romantic spirit in the pioneering of the electric power companies.

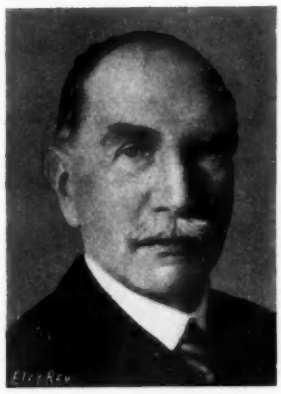
It was in 1897 that I was concerned with the B.T.H. Company in the preparation of the first scheme for large-scale distribution in this country, and in 1898 I was one of the promoters of the General Power Distributing Company which may fairly be called the Morning Star of the great Electrical Reformation. I have been given the privilege of glancing through the minutes of B.T.H. board meetings of that time, and I am intrigued to read that on September 7th, 1897, "Mr. Devonshire reported that he had been looking into a power transmission scheme in connection with the Electrical Pioneer Syndicate."

The First Bill

I was instructed to continue this work and eventually we prepared our plans to apply to Parliament for statutory powers. Our Bill asked for power to supply "the whole of the area included in the radius of 26 miles from the N.W. corner of the Parish Church of Warsop in the County of Nottingham and all cities, county and other boroughs, towns, villages, urban districts, rural districts, parishes and extra parochial and other places within this radius." At this distance of time I cannot remember what "other places" there may have been, but we were evidently determined to leave nobody out.

I see that our standard price was to be 3½d. per unit, our authorised share capital £750,000 with power to borrow £250,000. We asked to be allowed to "supply energy for all public and private purposes wholesale to any local authority, company or person," and to do that for ever, without being purchased by any public authority in the future, as provided by the Electric Lighting Acts then in force.

The many thousands who are engaged to-day in the power stations and in the offices of electricity authorities will find it difficult to realise what audacious giant killers we must have looked in 1898. There were municipalities and companies selling electric light and there was a prospect of general tramway electrification; but the use of electricity for driving machinery was scarcely taken seriously at all. Even electric light was having a rather hard struggle, and there were many municipalities making "profits" out of their gasworks which were determined to keep electricity away as if it were a wolf at their door. Enterprising promoters who offered to carry on this business within their borders were quite accustomed to receive a letter from the outraged Town Clerk containing some such expression as "Are you aware that the Council own the gasworks?"



[*Elliott & Fry*

Sir James Devonshire, an original member of the Council of the Incorporated Association of Power Companies

Moreover the policy that we recognise as national self-sufficiency in Europe was very rampant in municipal affairs at the beginning of this century, and the idea that the boundaries that suited the local rate collector were unsuitable as defining areas for electrical distribution was regarded as outrageous and piratical.

Looking back forty years I feel a glow of gratification that our revolutionary Bill should have resulted in this bold challenge to the then strictly parochial system of electrical supply.

The House of Lords has often been denounced as a Diehard fortress of reactionary old fogeyism, but in our case without justification. Having been considered by that House first, we proved our case, and passed third reading on July 12th, 1898, and our Bill was sent to the Commons.

Subsequently a message was received in the Upper House from the House of Commons to acquaint their Lordships that any further proceedings had been suspended until the next session because the delay in the proceedings on the Bill was due solely to the action of Parliament in referring the question of principle involved in this and other Bills to a Joint Committee, and the Lords were requested to concur in such suspension. On July 21st their Lordships resolved that the promoters of the Bill, which had been introduced into the House in that session and which had been passed and sent to the Commons, should have leave to reintroduce the Bill in the next session with the privilege that "the proceedings on such Bill shall be pro forma only in regard to every stage through which it shall have passed in the present session and that no new fees be charged in regard to such stages."

In passing, I may say that I have no knowledge of any "other Bills" referred to in the message from the Commons.

So we come to the Lord Cross's famous Committee of 1898 which was appointed to consider and report on a number of questions, number four being:—"Whether powers should be given in any case for the supply of electrical energy over an area including districts of numerous local authorities, involving plant of exceptional dimensions and high voltage."

During the course of its proceedings this Committee examined eminent engineers of the period, such as Swinburne, Hopkinson, Preece, Alexander Kennedy, and Binnie, and the other witnesses were either the town clerks or chairmen of municipal electricity committees. It will perhaps amuse my younger readers to learn from this evidence, for example, that while Sheffield and Nottingham had not a single solitary power consumer, Manchester was actually supplying 2,000 h.p., but when the witness testified that "the demand has become very great" he was referring to the colossal figures of electric lighting, no fewer than the equivalent of 124,542 eight-candle-power lamps being already connected, with 1,300 per week being added.

I have no space to quote quaint and interesting curios from this evidence given in 1898. What is material to my present purpose is the statesmanlike conclusion of this brave Committee which reported, amongst other things, that "Where sufficient public advantage is shown powers may be given for the supply of electrical energy over an area including districts of numerous local authorities, and involving plant of exceptional dimensions and high voltage. The Committee further think that undertakings of this character may properly be authorised on conditions differing in some respects from those imposed by and under the existing Acts." The Committee also recommended that the undertakings so established should not be subject to the ordinary rights of purchase by local authorities.

There you have, in effect, the Magna Carta of electrical supply, the first declaration of its freedom to overrun parish boundaries; and it is from that epoch-making pronouncement that the Electric Power Companies date the commencement of their career of great national service. Nevertheless, my friends and I suffered the common fate of pioneers, though, for what it was worth, our Bill died a really romantic death. It was reintroduced in 1899; given its walk-over by the Lords, and read a first time in the Commons on February 20th, 1899.

But, of course, when we go to the Commons we have to convince members who have constituencies to consider as well as active local politicians who may be in control of the municipal authorities concerned. On the second reading a resolution was moved that consideration be adjourned for six months, which is the formal way of finally disposing of such awkward proposals. On the division the count showed 149 ayes and 149 noes—a dead heat; but one member whose name I do not remember, came forward and alleged that his vote had not been counted, and he became a great big decisive NO all by himself, and so our career was ended. Our famous suspended Bill was therefore defeated in the Commons by one vote.

A Little-known Fact

I see no reason why it should be buried as an unknown warrior, and I think it worth while letting all our electrical army of to-day know, perhaps for the first time, that the history of the power companies does not merely date from the passing of Bills in 1900 authorising the North Metropolitan, the County of Durham, the Lancashire, the Newcastle and the South Wales companies which are now operating on such a grand and prosperous scale. Of the North Metropolitan Company I was appointed managing director in 1903 and have been on the board ever since.

Others will take up the tale from this point in later issues of the ELECTRICAL REVIEW, but they will scarcely be able to combine true historic fact with quite so much drama and romance.

The martyrdom in 1898 of our General Power Distributing Company undoubtedly brought about the great reformation, although those who followed had still to overcome appalling difficulties before the very limited powers originally granted in 1900 were gradually extended by amending Bills which have resulted in the magnificent achievements of the Power Companies in these thirty-odd years, and the stimulus they have given to every department of electrical progress throughout the country.

Transmission Engineering

Members of the Institution visit the B.T.H. Willesden works

THE large variety of power switchgear that is produced by the British Thomson-Houston Co. was well exemplified during the visit on March 17th of the Institution of Electrical Engineers Transmission Section to the Willesden works.

Probably the most impressive of the three self-contained works that have evolved from the first factory, which was put up in 1924, is what is known as Building No. 3. This is equipped for the assembly of metal-clad switchgear of the heaviest kind, such as the 132-kV circuit-breakers fitted with oil-blast explosion pots and rated at 1,500,000 kVA now nearing completion for the Central Electricity Board. Also for the grid is a 66-kV oil-immersed electrically operated three-point isolating switch fitted with arc control; this is designed to break 40 A magnetising current for isolating teed cables.

A large proportion of the switchgear on view is for 33 kV operation, many units being designed for a rupturing capacity of 1,500,000 kVA for various undertakings, including thirteen double-break double bus-bar equipments for Calcutta. Oil-filled bushings for voltages ranging from 22 to 220 kV also call for notice. An order for eighty distribution switchgear units for a London undertaking is also one of the features. Another sign of the times is the large number of kiosks under construction.

Mining and industrial metal-clad and truck-type switchgear and flat-back switchboards, are among the chief exhibits in Building No. 2, where outdoor rural control gear is also assembled. The latter includes expulsion fusible cut-outs, pull-down switch fuses and pole-mounted circuit-breakers. Here also are some 400-A low-voltage solinoid-operated oil circuit-breakers destined for Perth, Australia.

Method of Jig-drilling

The remaining building (the original one) is now given over to machine tools and high-speed presses, plating, tank rolling and fabrication. In connection with the last-named is a welding school for the training of operators. Of particular interest is the method of jig-drilling. Components to be drilled are clamped to a work-table movable in all directions and the position of the holes is determined from a master plate. The table is accurately located from holes drilled in in the plate at centres corresponding to those required between holes in the product.

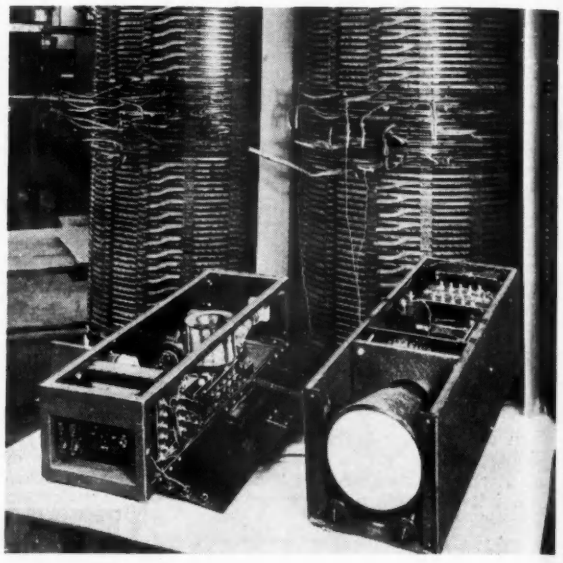
The oil-filled bushings department

In another part of the same shop are plants for the electrolytic deposition of silver on switchgear contacts and for the brazing of silver and copper by the simultaneous application of electrical heat and mechanical pressure.

Surge Analyser

Probably the chief item of interest to the visitors was the portable model of the B.T.H. recurrent surge analyser which was demonstrated in the test house. The equipment was set up for applying recurrent impulses to a transformer stack, and demonstrating the resultant voltages in different parts of the winding. It is arranged in two parts, the first for generating the recurrent impulse and the second for viewing either the generated impulse or the voltages arising from it on the screen of a high-definition cathode-ray tube. Both parts derive their supply from the same phase and connecting leads ensure synchronism.

The principle underlying the design of this instrument is as follows: There are effectively four circuits, each fed with single-phase energy at power frequency from a common source. The first supplies a cathode-ray tube of the high vacuum sealed-off type, which exhibits a spot once per cycle. The second circuit consists of a low-loss reactor, the iron core of which produces a field at right angles to the electron pencil. Since this field is approximately in time-quadrature with the applied voltage, the cathode-ray tube spot is swept across the screen once in each cycle at a speed which is very closely constant, and so constitutes movement of the spot in the "time" direction. The maximum speed available in the time direction is 1.4 mm. per micro-second.



Recurrent surge analyser opened up

The third circuit is used to generate a transient disturbance which may conveniently be of the usual 1/50 micro-second impulse-wave shape (that is, an impulse in which the crest value is reached in about one micro-second and half amplitude in 50 micro-seconds). The disturbance is generated once per cycle, at an instant when the excited cathode-ray spot is traversing the screen. For this purpose a thyratron, used to generate the impulse wave, is tripped by the remaining circuit, which is for synchronising, and uses a peaking transformer to relate the instant of generating the impulse to that of current zero in the scanning coil.

Other Testing Equipment

In the normal equipment of the test house the most noticeable feature is a single-unit testing transformer, which is supplied by a 1,100 kVA sine-wave alternator driven by a 900-kVA synchronous motor; the latter also serves to correct the power factor of the works motors, for which 1¼ million kWh is purchased annually from the public mains. In the centre is sunk a tank holding 15,000 gal. of oil for the immersion of oil-filled bushings undergoing puncture tests.

For producing lightning conditions up to 1.4 kV an impulse testing equipment has been installed. The condenser bank comprises twenty-eight 0.5 μF. pyramid condenser units connected to a Marx circuit and charged by means of a half-wave rectifying kenotron equipment, which is excited from a 150-kV transformer. Inductance and resistances connected to the discharge circuit enable the wave shape to be adjusted.

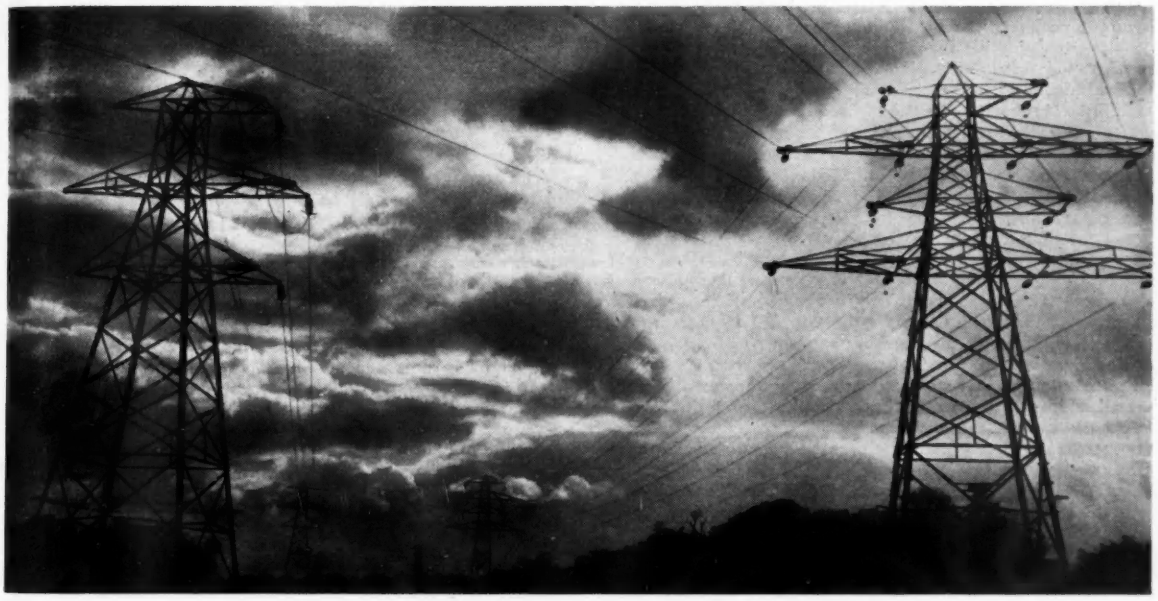
Progress of the Grid System

The Central Electricity Board's report

ELECTRIFICATION is proceeding in this country at a greater pace than in the world as a whole, according to the report of the Central Electricity Board for 1936 (Whitehead Morris, 1s.). Since 1929, the output of electricity in Great Britain has increased by over 95 per cent. compared with the general average of 35 per cent., and last year's increase of 2,650 million kWh (the greatest recorded) brought the total to 20,000 million kWh.

Trade revival and rearmament have led to the extension of old and the erection of new works requiring electric power, while railway electrification, more adequate illumination (both indoors and in streets), and continued expansion in domestic uses and in rural areas have all been contributing factors. Many undertakings have sought the assistance of the Board's staff in large power negotiations which call for investigation not only of the cost of giving supplies but also of the cost attainable with other sources of power.

At the end of 1936, the grid system comprised about 4,125 miles of transmission lines (of which 2,898 miles were operated at 132 kV) costing £9,700,000 for overhead lines and £5,800,000 for underground cables, in addition to 289 switching and transforming stations with an aggregate capacity of 9,474,800 kVA costing £14 million. Among the 132-kV lines under construction were those to Bourne and Leatherhead, between Ironbridge and Stoke-on-Trent and between Fulham and Willesden.



Single-circuit and double-circuit grid towers near Nursling, Hants

Selected stations number 137 with an installed capacity of 7,206,045 kW. These comprise 128 existing stations and nine of the sixteen new stations for which the scheme provides. Three of the new stations—those of the Galloway Water Power Co.—were put into commission last year.

Plant Extensions

During the period under review 554,000 kW of new generating plant was brought into service, part of which was to replace obsolete units. This included two 60,000-kW turbo-alternators at Fulham, two of 50,000 kW at Hams Hall, one of 50,000 kW at Ironbridge and also at Kearsley, and 30,000-kW sets at Nottingham, Northampton, Stuart Street (Manchester), Neepsend and Blackburn Meadows (Sheffield). Arrangements were also made for the installation, at a cost of £12.5 million, of 858,000 kW with boilers having a total evaporative capacity of 10,280,500 lb. per hr. to meet the increased demand of 1938-39, and in some cases of 1939-40. This is apart from the first section of 120,000 kW for a new station at Dartford which was sanctioned after the end of the year. The standardisation of frequency is now practically completed.

Research Results

It is hoped that the effects of surges may be prevented as a result of research work carried out by the Board in conjunction with the Electrical Research Association and the National Physical Laboratory. The result to date has been to improve the design of transformer insulation and to demonstrate the desirability of extending the use of the earth wires in certain localities. Practical tests on grid lines of certain types of lightning arrestors and protective gaps have proved inconclusive. The efficacy of Petersen arc suppression coils in clearing single-phase intermittent faults is to be tested on two 33-kV sections of the grid.

Information obtained from short-circuit testing stations will be reflected in new designs of switchgear, more especially (at 132 kV) in modification of the operating mechanism and contact devices. Current limiting reactors are being installed at various points in consequence of increased generating capacity.

No flash-overs occurred on the anti-dirt and anti-fog insulators installed in certain districts, in spite of exceptionally unfavourable weather. Washing of live sub-station insulators by water jet has reduced the costs of cleaning and liability to flash-over. Permanent washing equipment is being installed at sub-stations in polluted or salt-laden atmospheres.

Tests on s.c.a. conductors that have been exposed to corrosive surroundings confirm that deterioration both of the aluminium and of the steel-core is inappreciable. Periodic conductivity tests of joints are, however, essential to ensure immunity from damage with heavy currents. A scheme of joint testing of lines in service is expected to reduce greatly the periods during which lines must be out of commission for testing. The efficacy of the anti-vibration dampers fitted to the 132-kV lines has been established by recording instruments.

Oil-filled cables for 66 kV and 132 kV continue to be satisfactory There was no instance of electrical breakdown, although mains troubles arose from the formation of gas in the oil, which is now being treated to give improved performance without taking the cable out of service. An experimental mile of 132-kV nitrogen-filled cable (200 lb. per sq. in.) is to be laid.

In several cases undertakings which originally asked for grid supplies at 6.6 or 11 kV have requested the voltage of connection to be raised owing to growth of load and to improve voltage regulation at their more distant points of supply, and to reduce congestion of underground cables near main distribution centres. High-speed selective and protective gear of both impedance and reactance types has been adopted for the protection of lines under construction. The installation of additional generating plant or the giving of new supplies has not called for any departure from the types of summator and printometer equipments originally adopted, which continue to be accurate and reliable.

General trading was in progress throughout the country except in North-East England (pending completion of frequency standardisation), South Scotland (for which a grid tariff was fixed at the beginning of this year), and North Scotland, where no grid scheme is in contemplation. Of the 571 undertakings in the trading areas, 194 were supplied directly by the Board and 309 through the systems of the other undertakings. About 95 per cent. of the electricity consumed in such areas was generated in 155 stations under the direction

of the Board. Only twenty-six of these stations ran for the full year, two-thirds of the number being operated for less than 6,600 hours, and five were not used. Sixteen stations produced more than half the total output.

Fuel burned per kWh sent out was 14 per cent. less than the average in 1932, under independent operation. Had the coal prices ruling in 1935 been maintained this would have meant a saving of £1,920,000 compared with the £920,000 recorded. Owing to an increase of 11 per cent. in the average price of the 12 million tons of coal used at these stations, more than one-half of the reduction in fuel cost per kWh since normal trading began in 1933 has been lost. Difficulties are being experienced in obtaining deliveries of coal of the size and quality required by the designs of boiler furnaces, and a joint committee of the I.M.E.A. and the I.A.E.P.C. is endeavouring to secure amelioration.

Since trading began the proportion of reserve generating plant has rapidly declined to a figure that is now regarded as appropriate to interconnected working, the capital saving thereby being estimated at £14 million.

Trading with Selected Station Owners

The owner of a selected station has the right to purchase from the Board all the energy he requires for the purposes of his distribution undertaking and the price payable for such supplies is regulated by Sections 7 and 10 of the 1926 Act. This may be either the area grid tariff or the cost of production plus a proportion of the Board's expenses. Section 7 also permits of agreement between a selected station owner and the Board of the price at which electricity shall be supplied by the Board.

While the owners of some base-load selected stations make savings under this system experience has shown that in other cases the disposition of load or the absence of sufficient spare plant in the station has precluded a transfer of overhead charges large enough to provide such a saving. In those cases the owners have to rely upon Section 13 which guarantees that the cost of electricity required for their own undertaking shall not exceed the cost at which they could have provided it themselves under independent operation and the amount payable is determined by the Electricity Commissioners. In practice the Board has been able to agree prices with selected station owners and only one case, which is pending, has been referred to the Commissioners.

It is maintained that such settlements by agreement ensure that all additional costs resulting from the use of the station for exports to the grid are borne by the Board and that there is no reason to suppose that the operating conditions imposed on a base load station are more onerous or more likely to reduce the life of the plant than those which would apply if the station were operated to supply only its owner's requirements. Section 13 ensures, however, that if earlier renewals or replacements eventually prove necessary the cost will fall upon the Board.

While, therefore, there can be no loss to the owner of a selected station it is now generally recognised that the application of the trading provisions of the Act does not lead to an equitable distribution among the selected station owners of the available savings. In North-West England and North Wales a scheme has been evolved, in collaboration with the District Consultative Technical Committee, to overcome this defect. This provides for the pooling and quinquennial distribution during the first tariff period of the savings which otherwise would have enured to the benefit of a few.

Early last year the Incorporated Association of Electric Power Companies put forward a proposal designed to afford selected station owners a remuneration considered to be more commensurate with the service rendered to the grid by the stations. The Board found, however, that the proposal was unacceptable as it involved the provision of sums in excess of the available savings and was thus incompatible with the financial basis of the grid.

Reference is made to the operation of 25 selected stations under arrangements with the Board. Two more—Taunton and Scarborough—were added to the list last year.

Finance

The total amount which the Board is empowered to borrow remains at £60 million and consents have been issued by the Electricity Commissioners for the borrowing of £52.5 million. During the year an issue was made of £3.5 million of 3¼ per cent. stock at par, raising the total nominal value actually issued to £53.5 million. The actual proceeds have amounted to £50,672,500, leaving a further £9,327,500 which may be raised under the existing borrowing powers.

The revenue (general purposes) for the year 1936 available to meet capital charges was calculated at £1,689,487. This was applied as follows:—Interest on stock, £1,131,516; redemption fund contributions, £250,000; and £307,971 was carried forward.

The Board is empowered to pay interest out of capital on its stocks up to certain dates and satisfaction is expressed that it has been able to charge a certain amount of interest to revenue well in advance of the obligation to do so. The sum carried forward is added to £1,111,643 brought in, and the total (£1,419,614) will be available to meet the interest and redemption fund charges which will fall to be paid out of revenue.

The accounts relating to change of frequency are separately set out; the charges in this case are met by a levy upon the whole of the supply industry made by the Electricity Commissioners.

Selected Station Owners' Views

The grid and the McGowan Report

DURING the last two or three years the chairmen of some of the leading electricity supply companies have expressed dissatisfaction with the terms on which the Central Electricity Board purchases power from their selected stations. This year even stronger comments have been made at some of the annual meetings.

Sir Francis Fladgate, chairman of the London Power Company, at the annual general meeting of the company on February 12th devoted a great part of his speech to the matter. He mentioned that the "exports" from the company to the Board had greatly increased during 1936 and the time had arrived to take steps to rectify, if possible, "the anomalous and unfair position" which existed between the Central Board and the company. Unfortunately, the reply received from the Board to a communication had been most unsatisfactory. The Central Board did not seem to recognise the fact that the position of the London Power Company was a unique one and differed in many respects from that of the majority of owners of selected stations.

Explaining the relationship between the company and the Board, Sir Francis referred to the London Electricity (Nos. 1 and 2) Acts, 1925, and said that their company, in the Western areas, which were dealt with by the No. 2 Act, had fulfilled the promises made in Parliament. In 1926 the average total cost per kWh was 0.971d., and for 1933 this was reduced to 0.4702d. The average charges of constituent companies during those years also showed a corresponding reduction, the figures being 2.4d. per kWh for 1926 and 1.22d. per kWh in 1933.

The most important reduction in the total cost of electricity from the generating stations was caused by reason of the capital charges for interest, sinking fund, &c., being spread over a larger number of kWh. This could be brought about to a greater extent in combination with the Central Electricity Board than when operating independently and it would only seem fair that reductions in cost caused by this co-operation should be apportioned between their company and the Board, in accordance with the amount of electricity respectively consumed by the two bodies. If it is very practicable to work under Section 7 of the 1926 Act some portion of this would be saved for their company, but working under this section they were burdened to an extent of £345,000, being an apportioned share of the overhead charges of the Central Board. Because of this the London Power Co., had to make its claim under Section 13 of the Act, with unsatisfactory results.

The Central Board claimed, in its last report, that no owner of a selected station could be placed in a worse financial position than he would have been if the Act had not been passed. He (Sir Francis) was not, however, prepared to admit this claim, as, while there might be no loss in actual pounds, shillings and pence, if the cost was arrived at under Section 13, nothing was paid in respect of capital charges, rates and taxes, and it was impossible to suggest that the user of the owner's plant, &c., could not be otherwise than prejudicial to the capital value of the assets. Why Section 13 operated in such a prejudicial manner was explained by the fact that whether or no the Act of 1926 had been passed or whether or no the Central Board operated, exactly the same amount was payable by their company in respect of interest on capital charges and sinking funds, whatever the number of kWh generated; consequently this burden fell on their company and the benefit of spreading the capital charges over a larger number of kWh generated went to the Board—which was to benefit the whole of the country.

Was it not, therefore, wholly unreasonable that while the Board received benefit for areas other than London, nothing should be given to areas in London for whose benefit the 1925 Acts were passed? On the other hand, their company could make no profit, while the constituent companies, so far as they were distributing companies, had to hand over six-eighths of any economies to their consumers. There remained companies who were themselves responsible for bulk distribution for the companies with which they were associated and in all fairness

these should be supplied at a lower figure than those companies acting only as ordinary distributors. But why should they be charged more for electricity employed for their use than the Central Electricity Board for the undertakings which it supplied? The cost per kWh last year to the Board was under 0.2d., while the cost for their companies in the Metropolis was almost 0.5d., which clearly indicated the unfairness of the position.

Mr. G. Balfour's Criticism

Speaking at the meeting of the Lancashire Electric Light and Power Co. on February 18th Mr. George Balfour, M.P., referred to the operation of the Lancashire Electric Power Co.'s stations as selected stations, which, he said, involved difficulties in accounting and capital payments. He was glad to say that they had temporarily got rid of differences regarding this matter. An agreement had been reached and, while they did not regard it as satisfactory, by the end of 1938 it would provide the company with some compensation for the past use of its capital.

Last week Mr. Balfour said a great deal more at the meeting of the Metropolitan Electric Supply Co. After mentioning the remarks made by Sir Francis Fladgate, he went on to say that the Metropolitan Co., in common with other London companies, had had to bear the burden to which Sir Francis referred. It was easy, he said, for certain local authorities who obtained their electricity from the Central Board direct, or relayed through the Joint Electricity Authorities, to make gifts to their consumers out of sums which should provide interest on capital to the London Power Co., which would enable that company to reduce the charges to be borne by the constituent companies, a large part of which fell upon the Metropolitan Co. and consequently upon its consumers. He continued :—

> "The legality of certain contracts entered into by the Central Electricity Board was challenged and in consequence the Act of 1935 was passed to legalise them. Such legislation may be based upon some international conception of public probity—it is certainly not the ordinary British idea of honesty or fair dealing. The blame does not rest with the Board or staff. They not unnaturally in their awkward financial position took full advantage of all the authority they possess, including the last Act, and adopted what many in the industry regard as a very strained interpretation of their powers. They appear to be very much in the position of licensed burglars, and as the London Power Company happen to own property open to their licensed operations we have to suffer from their depredations."

The County Company

The next chairman to mention relations with the Central Board was Sir Bernard Greenwell, Bt., of the County of London Electric Supply Co. At the company's annual meeting last week he said :—

> "I have mentioned in my previous speeches to you the fact that any benefits of the working of the Central Electricity Board do not come our way; we do not agree with the manner in which they operate the Act of 1926 so that people like ourselves, who contribute so much to the grid scheme, should obtain no share in the advantages which must accrue in the general pooling of supplies. But I am not going to labour the point any further this year. I must, however, say this: that the very involved technical and accounting work necessary under the Act of 1926 to enable us to establish our claim for payment to us by the Central Electricity Board for the 831 million units which they took from us last year has been greatly facilitated by the helpful and expeditious way in which the Central Board have again met and agreed our figures, so enabling the accounts to be presented to you in their final form."

Lord Ashfield's Statement

The purchaser's rather than the vendor's point of view was expressed by Lord Ashfield at the annual meeting of the North Metropolitan Electric Power Supply Co. on March 16th. Mentioning that the company "exported" 8,930,000 kWh to the Central Board in 1936 and "imported" 236 million kWh from the Board he said :—

> "The operation of our stations under the control of the Central Electricity Board necessarily demands the most friendly co-operation between the officers and staff of your company and of the Central Board, and I am happy to be in a position to repeat what I said last year, namely, that our relations with the Central Board have continued to be satisfactory. What I have said of our relations with the Central Board is equally true of our relations with the Electricity Commissioners and other public bodies, and in particular with the local authorities, with whom our duties bring us into contact. We seek to co-operate with them in their efforts to secure for the public a cheap and abundant supply of electricity, and I am happy to think that the policy which we have set ourselves to carry out is one which, in general, receives the approval of these public bodies."

Comments on the McGowan Report

The proposals of the McGowan Committee on Electricity Distribution have naturally received attention from the chairmen of the supply companies.

At the meeting of the Yorkshire Power Co. on February 15th Mr. Robert Armitage, referring to this matter, said that from the lengthy experience of the company in the development of supply throughout its important area it had become abundantly clear that to obtain the best results the company's position should be made no less secure than that of the large municipalities, and that a large measure of unification should be brought about. The McGowan Report endorsed in a remarkable way the importance of the work done by the power companies and the views which the board had expressed as to the necessity for legislative changes. The company had expressed to the owners of the various distributing undertakings in the area its willingness to discuss arrangements with them on the lines recommended in the Report so that the benefits might not be delayed.

Sir Bernard Greenwell stated at the County of London Co.'s meeting that in so far as the Report dealt with the need for greater uniformity of tariffs and methods of charge the company and its associated concerns had already such uniformity in operation and other London companies were now ranged beside them in the endeavour to simplify for the consumer the vexed question of tariffs, so far as possible.

Where the report dealt with the position in London, it stated that there seemed to be no reason to recommend any variation in the settlement provided by the London Electricity Acts of 1925.

At the Metropolitan E.S. Co.'s meeting Mr. George Balfour said that so far as their outer London area was concerned they had for years past more or less given effect to the recommendations contained in the report. Their policy had been to acquire the technical and administrative control of authorised undertakings within their area. He had no doubt that but for the disturbance of recurring legislation, the consolidation in many large areas throughout the country would have been achieved.

While they had had to maintain the individual entities of their subsidiary companies, those companies in all essential details of administration and management had the advantage

[*Elec. Rev.* photos.

Special Siemens cable being installed near Buckingham Palace for televising the Coronation processions, &c.

of centralised control providing a high level of service and steady reductions in tariffs. He understood the disinclination of any authority to part with administrative duties, but, nevertheless, with confidence and goodwill on all sides he felt sure that they would be able to agree with the various authorities supplying relatively small districts within the scope of their bulk-supply territory with advantage to the authorities and the consumers. Mr. Balfour referred to the acquisition of the ordinary share capital of the Notting Hill Co. as one co-ordination movement recently made by the company.

In the "Northmet" Area

Lord Ashfield maintained at the meeting of the North Metropolitan Co. that the area served by the company was perhaps as good an instance as existed in this country of the advantages to the consumer of having a single undertaking responsible for the supply of electricity over a large area. Their supply area possessed a considerable diversity of character. The southern sector included densely-populated urban areas with a large number of factories while the northern sector was mainly rural and sparsely populated. Notwithstanding this difference practically the whole of the area was now covered by distribution mains and the system of distribution was almost entirely standardised. The fullest facilities for the hire-purchase of apparatus and the wiring of premises were also provided throughout the area and there was a large number of offices and showrooms.

On the question of rates of charge the company had established an all-in rate for domestic consumers which, although the standing charge varied as between the urban and rural districts, provided for a standard "unit" charge of ½d. Thus, over a period of years, they had pursued a policy in respect of distribution, extension of facilities and rates of charge which were in harmony with the recommendations of the McGowan Committee.

Lord Ashfield also reviewed the Committee's recommendations with regard to power companies.

Development Activity in 1936

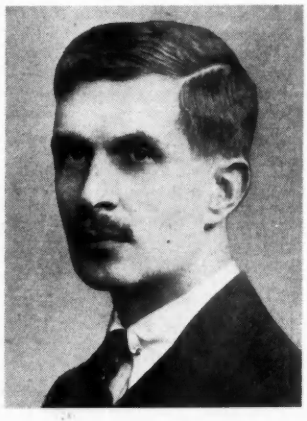
E.D.A.'s annual meeting and report

THE British Electrical Development Association was able to report increases in both membership and revenue during 1936 at the 17th annual general meeting held on Friday last week. The number of members rose by 27 to 434 and the total revenue by £12,163 to £102,571, an increase of more than 13 per cent.

Press advertising was actively pursued during the year, and the local advertising service was increasingly employed by members. The little "I'm Electric" figure introduced during the "Million New Consumers" campaign proved very popular, and large quantities of stereos, badges, cut-outs, posters, stamps, &c., bearing the device were disposed of.

The "Better Light—Better Sight" campaign scored a notable success with the wholehearted support of supply authorities. Nearly 400,000 copies of a special folder were distributed, 15,000 double-crown posters were used and 160 special window displays were arranged.

The exhibition of the talking films continued, 47 members having booked them during the year. One of the films—"The Wizard in the Wall"—has been shown in all the State schools in Victoria (Australia). The sale of general publicity matter, window displays and advertisement blocks to members during 1936 amounted to over £15,000, an increase of over 15 per cent.



[*Lafayette*

Ald. J. Chuter Ede, the new E.D.A. President

Other activities which proceeded on a satisfactory level were "Electrical Housekeeping" (sales of which rose considerably), the E.D.A. calendar, the processional car (which took part in 37 carnivals), and the showroom advisory service. The Association co-operated with the Southern Railway and the Portsmouth Corporation in the production of a film, "The Way to the Sea," dealing in part with the extension of the Southern electrification. Another piece of work in this connection with the preparation of the brochure outlining the case for railway electrification which was circulated to Members of Parliament, railway directors, political organisations, &c.

Press Publicity and Lectures

A great deal of publicity was secured in the editorial columns of the Press in such forms as direct news, articles, photographs, letters, &c.; the "Better Light—Better Sight" campaign was particularly successful in this direction. During the year 280 lectures were given in the Association's various areas on a variety of electrical subjects.

Over 100 undertakings were represented at the annual sales management conference, when papers on various aspects of salesmanship, advertising, showrooms, &c., were read by members of the E.D.A. establishment. Eighty-seven people attended the annual three-day training course for demonstrators arranged in April last in conjunction with the E.A.W. and E.L.M.A. It is stated that the fourth public speaking competition showed that the ability of the junior members of the selling staff of the industry has improved further.

The services of the Association's specialist staff were utilised by members to a greater extent than ever before. Advice with regard to the promotion of rapid development of the use of electricity for domestic and commercial purposes was given in a large number of cases, details of hiring schemes and installation schemes being in frequent request. Quarterly returns relating to the number of domestic appliances in use are being obtained from the majority of supply authorities in the country, and these are summarised, forming accurate records of domestic electrical progress.

The Association again participated and assisted in a number of exhibitions, including the Ideal Home Exhibition, the I.M.E.A. Convention Exhibition (considered to be one of the largest electrical exhibitions held in this country for some years), the International Building Trades Exhibition, the British Industries Fair and a number of agricultural shows, particularly the Royal Show at Bristol, in which electricity was the only public service of lighting and heating employed on the showground. A 12-day exhibition of three all-electric kitchens was arranged at Charing Cross Underground station and was seen by about 30,000 people. The Electrical Section at the Building Centre, now co-ordinated in one spacious hall, forms an important part of the display which was visited by about 72,000 people last year. The electrical inquiries made at the Centre are put at 11,470.

Special Committees

The work of the committees on special subjects is reviewed at some length in the report. A new report on domestic water heating (E.D.A. 1338) was produced. This urges the institution of simple hire schemes, describes appliances and installations and recommends the specialisation in the subject by one or more members of sales staffs. The Electric Cooking Committee has given special attention to mass cookery demonstrations and reports that returns from over 40 supply authorities show that average annual maintenance costs fell from 8s. per cooker to 7s. The Refrigeration Committee conducted national advertising which produced such satisfactory results that it was decided to inaugurate a sales and publicity campaign in 1937 on more ambitious lines.

The Street Lighting Committee prepared a memorandum upon the interim report of the Ministry of Transport Committee on the subject, and material was prepared for a new brochure on holiday and festival lighting. Electricity in rehousing formed the subject of a booklet produced by the committee on Electricity Supply to Small Dwellings. The work of the committees on Rural and Agricultural Electrification, Industrial Heating, Central Heating and Electric Traction is touched upon.

The No. 1 Co-operation Committee (manufacturers) met once during the year and discussed the linking up of manufacturers' advertisements with E.D.A. national campaigns; tentative proposals for a National Electrical Exhibition at Earl's Court in 1938; and propaganda for railway electrification. No. 2 Co-operation Committee (contractors and wholesalers) met twice and discussed the question of achieving "that wide measure of co-operation between the Associations concerned envisaged in the resolution passed at the National Electrical Convention at Bournemouth in June, 1935."

Appended to the main report are reports of the Area Committees, the Electric Vehicle Committee and the Electrical Association for Women, as well as tabulated particulars of the membership, receipts and expenditure, &c.

The Luncheon

Lord Eltisley, K.B.E. (President) was in the chair at the luncheon held at the Savoy Hotel, London, and the guest of honour was Sir Thomas Inskip (Minister for the Co-ordination of Defence). There was a company of about 550.

Sir Thomas Inskip proposed "The British Electrical Development Association," and commenting on the work of the Association, said that electricity was as important a munition as was the forge, the press or the machine tool, and the Government was very fortunate in its armament programme in having the grid, which afforded a vast reservoir of energy. Apart, however, from the indispensable part which this supply of electricity played in the programme of national defence in time of peace, there was the value of our great power stations in an emergency, as they had now been co-ordinated and interconnected. An illustration of the value of the grid was the scheme which was proposed recently to make an essential munition product, viz., calcium carbide, in a remote part of Western Scotland. If it were necessary to bring such a works into immediate production there would be no need to wait for the completion of a hydro-electric power scheme; by the use of the grid such a works could be brought swiftly into use not in three or four years, as would otherwise be necessary, but in three or four months.

A feature of electricity supply was that it was essentially a home product. The more electricity could be developed the more likely would prosperity be brought to some of the hardly pressed districts where the production of coal had been the chief activity of the people.

The President, in responding to the toast, said that the electrical industry would do everything in its power to see that the men who in the ultimate resort would be responsible for the protection and defence of our homes should be provided with the latest modern equipment in order successfully to carry on that defence. If the need arose, underground power stations and bomb-proof shelters for switchgear could be built, but the Minister for Co-ordination of Defence must be prepared in the national interest to give the assistance and support which that national service might be worth.

In the meantime every effort must be made to develop the vigorous policy of electrical development which was now being pursued. There was no fear of saturation, for even where cur-

rent was available 40 years ago there was still a progressive demand on a larger scale than before.

Commenting on the McGowan Report, Lord Eltisley said it was too early yet to discuss the Government proposals, but the industry appreciated the fact that the principle contained in this Report had been accepted. The industry also appreciated the fact that there would be no legislation this year and that plans and schemes were to be prepared and ample opportunity given for registering objection or criticism.

Annual General Meeting

Lord Eltisley presided at the annual general meeting which followed immediately after the luncheon, when Mr. C. D. Taite (chairman of the Council) presented the accounts which showed an increase in income from £90,400 to £102,000. Propaganda activities absorbed £80,700 or 77 per cent. of the total expenditure against 71 per cent. in 1935. He also drew attention to an advanced payment of £1,575 in connection with the Salesmanship Training Course.

Alderman J. W. Longley, who proposed the adoption of the accounts, urged that a larger sum should be allocated for the work of the Area Committees. He also commented on the fact that only 434 undertakings subscribed to the E.D.A. and contended that this was unsatisfactory seeing that all those undertakings which did not subscribe benefited by its work. Finally, he asked that the Association should do more work on behalf of power supplies, seeing that the consumption for power purposes represented the largest of all sections of consumers. Mr. H. E. Blackiston seconded the motion.

Mr. Taite, replying to Alderman Longley, said the Areas submitted their own estimates of expenditure and very little alteration was made in them by the Council. It was "up to" any district to ask for more, if there was good reason for so doing. He understood that it would not be very long before there would be a member of the staff to deal specially with power problems, although advice and assistance was available now to anybody who asked. The accounts were then adopted.

Mr. Taite then presented the report of the Council for last year, and drew attention to one or two outstanding points Referring specially to the salesmanship course, he said he hoped that undertakings would see their way to pay the fees for their staffs in advance and recover them in instalments from those taking the course. Several undertakings had set the good example of offering to pay 50 per cent. of the fees if the candidate obtained a certificate and 75 per cent. if he obtained a diploma.

Success of Campaigns

Mr. Taite spoke of the success of the Million New Consumers campaign, and said that 800,000 new consumers had been connected during the past year. Referring to the refrigeration campaign, and also the lighting campaign, he spoke of the great support given by the manufacturers of refrigerators and lamps, and said there had been an increase of something like 100 per cent. in the sales of refrigerators last year. This had so satisfied the manufacturers that a very much larger sum was being found for the refrigeration campaign this year. With regard to the use of electricity for cooking at the Royal Agricultural Show at Bristol last year he said that similar arrangements were being made for the Wolverhampton Show this year.

Brig.-Gen. R. F. Legge moved the adoption of the report. Alderman J. Moore, who seconded, suggested that a copy of the report for last year should be sent to all members of Electricity Committees.

Popular Press "Nonsense"

In the discussion on the report Mr. J. W. Townley (West Ham) urged the need for making it known among the popular Press that E.D.A. could supply accurate information on electrical matters. He mentioned particularly the reference in the McGowan Report to electricity at ½d. per unit and the great amount of nonsense that had been published in the popular Press in this connection. He had even received a communication from a well-known firm of printers with regard to what they called the Minister of Transport's new Act in this connection.

A speaker suggested that copies of the Council's report should be sent to all non-member municipalities.

Mr. Taite said he would see that consideration was given to sending a copy of the report to every member of an electricity committee whether the authority in question was a member of E.D.A. or not. Every effort was made to ensure the publication of accurate information in the Press, and the Director had taken steps in this direction on several occasions. The report was adopted.

The President announced that Alderman J. Chuter Ede, M.P., had been elected President of the Association for the year 1936-7. Alderman Chuter Ede then took the chair and presided over the remainder of the meeting. On the motion of Gen. Wade Hayes, seconded by Mr. F. Forrest, a cordial vote of thanks was passed to the retiring President, Lord Eltisley. Mr. A. E. McKenzie proposed, and Mr. E. W. Tole seconded, a vote of thanks to Mr. C. D. Taite, who briefly replied. The meeting concluded with a number of other votes of thanks.

The E.D.A. Staff Organisation

The report includes for the first time a list of the principal members of the staff. As a matter of interest this is reproduced below :—

Director and Secretary: Alex. C. Cramb, M.I.E.E., M.I.Mech.E.

Advertising, Publicity and Exhibitions.—Business manager: V. W. Dale; advertising assistant: J. G. Jackson; exhibition and display assistant: C. Warrenne.

Technical Development.—Chief technical assistant: J. I. Bernard, B.Sc., A.M.I.E.E.; Heating Applications: E. M. Ackery, B.Sc. (Eng.); General Development—Architects and Builders: P. C. Honey; Street Lighting: J. A. Prowse; Electric Traction and Battery Vehicles; R. L. Acland, M.I.E.E.; Librarian—Information Bureau and Statistics: Miss J. B. Kennedy.

Editorial Publicity—Press Officer: E. Fraser Wighton.

Lecture Service—Official Lecturer: G. S. Francis.

Accounts: W. C. Spooner.

Secretarial: Miss T. L. M. Bunker.

Building Centre—E.D.A. Staff in Electrical Section: E. H. Berry and Miss E. Robinson.

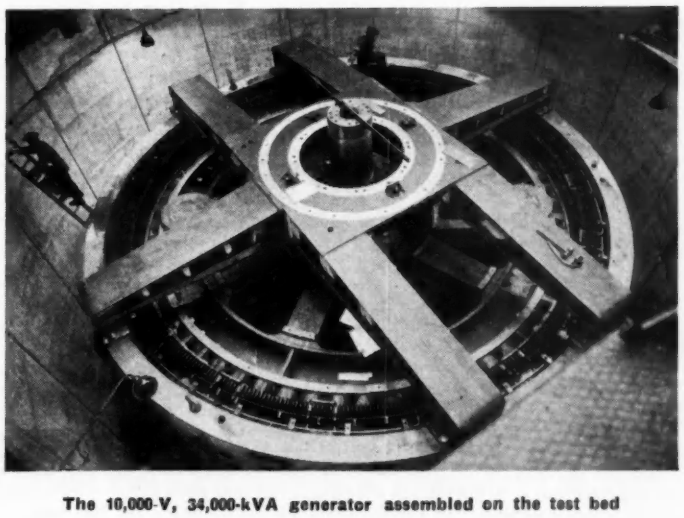
Area Organisation—Area Officer, Scotland: E. M. Hood; Mid-East England: A. W. Brown, M.B.E.; Northern Counties: A. Parkin; N.W. England and N. Wales: R. C. Hawkins; Central England: A. E. Neal; S.W. England and S. Wales: E. J. Dowson; South-East England: R. D. Reynolds; Secretary, Northern Ireland: H. Boyd.

Large Hydro-electric Set for Finland

A 10,000-V, 34,000-kVA generator for the hydro-electric generating plant which is now in course of construction at Rouhiala (Finland) weighs 485 tons and has a diameter of 31 ft. It had to be built to be transported from the factory in pieces weighing not more than 40 tons. The generator is a vertical-axis type intended to be driven by a Kaplan-type turbine designed to run at up to 265 r.p.m. The base upon which the turbine rests is built of steel and is designed to carry a total of 820 tons.

The rotor was built in sections, is 25 ft. 7 in. in diameter and weighs 235 tons when completely assembled, and it has a peripheral speed of over 360 ft. per second at 100 r.p.m. and 954 ft. at the maximum speed of 265 r.p.m. Similarly the stator was also built in sections, the coils being fitted into place before shipment.

Four machines of this types, which will develop 37,000 h.p. each, are being built for installation in the Rouhiala plant. On account of the dimensions of these machines it has been necessary to build special testing beds; for the rotor, a special well over 39 ft. in diameter and 32 ft. deep was built. So far only one generator has been completed by Siemens-Schuckert, of Berlin, the others being expected to be finished during the course of the year.



The 10,000-V, 34,000-kVA generator assembled on the test bed

The Testing of Materials

International co-operation in the scientific study of metals and other substances

At the second international congress of the International Association for Testing Materials, which is to be held in London from April 19th to 24th, over 200 papers, printed in English, German or French, are to be submitted from seventeen countries. The subjects to be discussed are arranged in four classes, each sub-divided. Group A (76 papers) deals with the behaviour of metals and contains a number of papers on the creep of steel at high temperatures, including contributions from Mr. A. Nadai (U.S.A., Westinghouse Electric and Manufacturing Co.), and from Dr. R. W. Bailey (England, Metropolitan-Vickers Electrical Co., Ltd.).

Regarding chemical action, it has recently been pointed out that the corrosion rate of an immersed metal will, at first, rise with temperature, on account of accelerated diffusion of oxygen, which favours electrochemical reactions. Prof. C. Benedicks (Metallografiska Institutet, Stockholm) is to discuss a case of direct influence on the electrochemical potential, which occurred in a boiler in Sweden working at 41 atm. and 420 deg. C. steam temperature. He submerged two bright iron electrodes in the branches of a U-tube containing water from the boiler and connected to a galvanometer. On heating one branch slightly, the galvanometer deflected considerably, corresponding to a dissolution of the metal at the higher temperature. The cause is said to be the dependence of the electrolytic potential of a metal on temperature. On account of the less noble potential of the heated metal as compared with the cooler metal a kind of "local element" is said to form, with corrosion of the hot centre, so that at any point of a metal surface (submerged in an electrolyte) possessing a higher temperature electrolytic corrosion will occur, attacking the hotter metal. This action is strengthened by, and may occur in addition to, oxidisation between the iron and water.

Mr. F. E. Bash (U.S.A.) will describe the method employed by the Driver-Harris Co. for life (endurance) testing as an aid in controlling the production quality of electric heating elements (resistors) for high temperatures. Prof. S. L. Hoyt and Mr. M. A. Scheil (U.S.A.) will discuss the life testing of a new heat-resisting alloy (No. 10, A. O. Smith Corporation) containing 53 per cent. iron, 38 per cent. chromium and 8 per cent. aluminium, for use as electric furnace resistor elements.

Examination Methods

Dr. A. J. Bradley (Manchester University) is to deal with quantitative metallographic X-ray technique. He will give a brief account of the methods employed for obtaining accurate lattice spacings, by means of which some surprising results have been revealed. Methods have also been devised for computing accurately, with the aid of photometric measurements, the X-ray intensity employed, even for very faint lines.

Dr. H. J. Gough (National Physical Laboratory) will outline the characteristics of the deformation and fracture of metals as revealed by X-rays. His experiments seem to afford, for the first time, a physical explanation of the form of the fatigue process; while his observations have thrown much new light on the actual changes in sub-structure associated with plastic deformation and fracture under cyclic and static stress.

Prof. G. S. Finch (Imperial College of Science and Technology, London) is to direct attention to the study of metal films and surfaces by means of electron diffraction. The skin, of a depth elastically accessible to an electron beam, may be available either as a detached film or *in situ* on a massive substrate. In the former case the specimen is traversed by a monochromatic electron beam and the angles (determined by the electron wavelength and the atomic arrangements within the film) which the diffracted rays make with the incident beam are photographically recorded at a known distance from the specimen. When the film is not detached it is examined with the beam at grazing incidence (reflection).

Electron diffraction has won a position for itself alongside X-rays and the microscope. Each has its own field and is complementary to the others. Most investigators who have employed electron interference in the study of the oxidisation of crystal surfaces have so far dealt with coatings on polycrystalline substrates, the crystallites being orientated at random. Prof. G. Aminoff (Swedish Museum of Natural History, Stockholm) has directed his work toward the investigation of thin films obtained by chemical change of a surface of a single crystal. He will describe the apparatus which he employs.

Dr. M. G. Burgers (Philips Lamp Works, Holland) intends to illustrate some of the results obtained from electron-optical observation (emissivity) of metal surfaces. The sample to be examined serves (in the form of a rolled strip heatable by electric current) as a cathode in a vacuum flask. Electrons emitted from its surface and accelerated by anodic voltage are focused by means of a magnetic coil on to a fluorescent screen. In this way an enlarged image of the metal surface can be obtained.

Electrolytic Aspects

Prof. A. Skapski (Mining Academy, Cracow) will review several methods of extracting electrolytically the non-metallic inclusions in iron and steel. Of the methods reported upon, he considers that of Treje-Benedicks, as improved by Skapski, to best fulfil the requirements, both of maximum recovery and of minimum contamination of the inclusions extracted. The author believes the electrolytic processes to be promising and says they deserve further attention.

Dr. A. G. C. Gwyer and Mr. H. G. Dyson (British Aluminium Co., Warrington) are to outline recent British progress in aluminium casting alloys. In the electrical field cast clamps for overhead transmission lines are now used to a considerable extent, and anti-vibration dampers employing aluminium castings have also been fitted in large numbers. In both these cases good corrosion resistance is a primary factor. Many parts for switchgear are made of aluminium alloys on account of their non-magnetic properties and light weight.

Non-metallic Substances

Group B (63 papers) is concerned with inorganic materials. In the ceramics sub-section there are to be two papers, by Ing. E. Suchy (Merkelsgrün, Czechoslovakia) and Mr. L. E. Barringer (G.E.C. of America) on the testing of electrical porcelain with the dual aim of determining the adequacy of the material and the suitability of the design as an insulator.

Among several communications on concrete there is to be a paper in which Mr. A. Brund (Harnosand, Sweden) will explain how the hardening of concrete can be so quickened by internal electric heat as to permit strength tests to be imposed on specimens about 24 hours (instead of 28 days) after preparation. When a.c. is passed through the mixture heat is generated in the paste, thus accelerating the reaction between water and cement. The electrical resistance decreases during the first period of hardening up to the beginning of binding, when it is at the minimum; it then increases during subsequent heating as the paste hardens.

The rates of curing in this manner are determined by placing samples of concrete paste in a metal box of standard dimensions. The box is lined with insulating material; between the latter and the concrete thin metal plate electrodes are inserted on opposite surfaces. A cover must be screwed on to make the box resemble an autoclave. The rate of curing is uniform throughout the mixture, because wherever hot spots develop the current is deviated to other areas of lower resistance where curing has not progressed quite so far. Thus heating is regulated automatically and all specimens are hardened uniformly.

Group C (45 papers) deals with organic materials and will include a contribution by Dr. G. Rossi (Italy) on the action of insulating varnish on copper.

Miscellaneous Subjects

In Group D (28 papers) several authors will discuss the relation between laboratory test results and behaviour in service, while others are to point out how recent advances in physics and chemistry are helping to widen the knowledge of materials. For instance, Ing. F. Guyot (Société O.R.E.X., Brussels) will state the advantages of industrial radiography by means of gamma rays, which are much more penetrative than X-rays and more easily handled when large metal objects have to be examined.

Mr. J. B. Chlonpek (Polytechnic Institute, Prague) is to outline recent trends in applied physical chemistry. Regarding artificial radioactive substances, deuterium leads by virtue of its ability to replace its lighter partner (protium) in practically all its compounds. The possibilities of this powerful tool of research are great in organic chemistry. The artificial radioactive isotopes promise probably as much for inorganic chemistry. Regarding properties of matter, notable advances have recently been made in dielectrics by the elucidation of the relations between dipole moments and the structure of molecules. Organic solvents as dissociating media are in the forefront of interest.

Mr. V. E. Pullen (Woolwich Arsenal) states in a paper that one of the most important requirements in practical non-destructive testing methods is that they shall be portable and

Meetings and Discussions

One of the subjects which received a great deal of attention at the annual conference of the Institute of Physics last week was the application of photo-electric cells in industry when a number of ingenious arrangements were described. The modern screw-type fan is becoming widely adopted for ships' engine rooms, refrigerated cargo holds, etc., and at a meeting of the Institution of Engineers and Shipbuilders in Scotland on Tuesday the principles and operation of these fans was dealt with by Mr. A. D. Third.

Physics in Industry

THE second conference of the INSTITUTE OF PHYSICS on industrial physics, with special reference to optical devices, was held in Birmingham from March 18th to 20th. In his presidential address Prof. A. Fowler showed how, although ordinary chemical analysis would not be entirely superseded, spectroscopy often provided all the information required very much more quickly. For the control of the lead sheathing of aerial cables to the specification of the quantity of antimony required by the Post Office Engineering Department spectroscopic tests had been adopted by all the leading cable manufacturers.

Among the principal addresses delivered was one by Mr. R. Donaldson (N.P.L.) on colorimetry, spectrophotometry and the inspection of manufactured products for "appearance." He explained that measurement of colour by a photo-electric colorimeter was, in principle, the same as the spectrophotometer method, which was too slow for routine work. Instead of going through in detail the process of finding the spectrophotometric analysis of the specimen and than transforming to the trichromatic system, the photo-cell might be made to telescope the whole operation together so that measurement was very much quicker. The response of the cell required to be modified by means of specially prepared colour filters, but owing to differences between individual photo-cells a common type of filter would not do for all instruments.

Mr. A. L. Whiteley (B.T.H. Co.) described how the photocell performed useful functions in industry. The selenium cell had the advantage of low manufacturing cost, but a slow speed of response and its output fluctuated with changes of temperature of the cell. It was suitable for simple applications where a large change of light was available and when the duration of the change of light was relatively long, say ½ sec. or more. In the voltaic cell selenium again formed the light-sensitive material. The major use of this type was as a light-flux meter; it was combined with a small microammeter to form a small portable instrument, usually calibrated directly in foot-candles.

The photo-cell as used in talking-film projection apparatus had a greater voltage sensitivity than any other light-sensitive device. Further, for all practical requirements of industrial control encountered so far its action was instantaneous. A relatively simple photoelectric relay could be made to respond to a light impulse of the order of 1/10,000 second. In many types of automatic wrapping and bag-making machines only a device which responded to the printed matter itself could provide the link between the web and the folding or cutting mechanism. Essentially the same system had been applied to high-speed rotary presses, for maintaining register between preprinted photogravure webs and other printed matter. Abroad, the system was used to maintain register between the design and the perforations of postage stamps. The above-mentioned system of control sometimes required the photocell to observe paper, &c., travelling at, say, 600 ft. per min. The impulse of light in the photoelectric cell might be only 1/1,000 sec.

A further useful property of the caesium type photocell was its rapid increase of output as the temperature of the source of light was raised. For instance, if the radiation from dull red-hot metal at a temperature of 1,400 deg. F. were focused on a photocell and the temperature were raised to 1,700 deg. F. (medium red) the output of the cell would be increased ten times. That was the basis of operation of the photoelectric pyrometer. Temperature could be read directly on an instrument, and hence measurements could be made rapidly, without the errors of observation associated with the optical pyrometer. The lowest temperature which would cause operation was about 1,300 deg. F. There was no practical upper limit.

A photoelectric cell, through the medium of an amplifier circuit, was capable of opening or closing a small contactor; the latter might be capable of making or breaking up to 15 A. Such a relay, using the caesium-type cell, would operate in a light change of only 1 foot-candle. It had been applied as a form of limit switch to precision gauges, for detecting when the shuttle of a high-speed loom became empty, counting moving objects, traffic control, &c. A modified form which would operate on a light intensity of 0.2 foot-candle was used to control street lighting.

Prof. G. I. Finch (Imperial College of Science and Technology, London) said that the "electron diffraction camera" represented the practical application of one of the most abstruse of scientific discoveries. A beam of electrons scattered at a crystal surface produced a diffraction pattern, analogous with those produced by an optical grating, or more directly with those obtained in the study of crystal structure by means of X-rays. Whereas X-rays penetrated deeply into solid materials, the penetration of the electron beam used in the "camera" was confined to the first few layers of atoms in the material which was being examined (less than one-millionth of an inch). It was therefore only the surface structure which was shown. This distinction conditioned the type of problem to which the electron diffraction method could be usefully employed.

In the type of camera which Prof. Finch used a parallel beam of high-speed electrons (30-70 kV) fell at grazing incidence upon a surface, or passed normally through a sufficiently thin film, the resulting diffraction pattern being first observed visually on a fluorescent screen, and then recorded upon a photographic plate.

Regarding the structure of electrodeposited nickel, micrographical examination alone, Prof. Finch stated, might lead to false conclusions. It might be concluded that the structure of the substrate was continued in the nickel layer, whereas the electron diffraction method showed that the surface nickel reverted to a different structure. While his own experiments had been confined to the study of thin films of nickel on copper, Prof. Finch urged that such findings implied that electron diffraction should now be regarded as an essential method in the study of electrodeposited layers.

The Testing of Materials (*Concluded from preceding page*)

mobile. This essential has now been realised with X-rays. Efficient and safe transportable equipments are now commercially available which are of sufficient power for most engineering needs. Radium is also easily transported and owes one of its unique advantages to the fact that it can be used in positions and places quite inaccessible to X-rays. The disadvantage of radium examination is the length of exposure generally required, and also the comparative absence of the detail that is obtainable with X-rays. Radium examination is valueless for the investigation of extremely fine flaws.

Sir Gilbert Morgan (Chemical Research Laboratory, Teddington) will deal with chemical researches into plastic materials. Electrical properties appear to be a function of the polarity of the constituent molecules. For example, a polar phenolic resin has a power factor about a hundred times greater than that of the non-polar hydrocarbon resin from polystyrene. By choosing appropriate phenols, resins can be made with various electrical properties, which are being studied in the author's laboratory in collaboration with the N.P.L. and E.R.A.

Industrial Applications of Photo-electric Cells

Fans for Large Applications

Screw-type Fans

THE advantages of axial flow of air, exceptionally high efficiency and adaptability are claimed for screw fans in a paper by Dr. A. D. Third (Thermotank, Ltd.) that was read before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND on March 23rd.

Where silence is of importance the centrifugal type of fan, for which a lower blade speed suffices, is generally favoured.

Streamlining of the driving motor is an essential adjunct, and gives the screw fan its torpedo-like appearance. This type differs from the propeller fan because the blade widths increase towards the hub instead of being parallel or widest near the tip.

The torpedo fan has a comparatively flat b.h.p. curve, with the maximum at, or near, the rated conditions, which is an ideal characteristic in a fan, as little or no surplus motor power is necessary to allow for changes in the operating conditions. Of still greater importance is the absence of a sharp peak in the efficiency curve, which is such a conspicuous characteristic of centrifugal fans.

Volume control by speed variation is always to be recommended, and even where this is not easy it is usually worth the extra expenditure to make in possible. With a.c. supply, the

difficulty may be overcome by installing a squirrel-cage motor with double field windings, or by having a rope drive with varying pulley sizes, or actual speed regulation may be obtained by a slip-ring motor, or hydraulic coupling, although both these latter methods involve a considerable loss in efficiency at the lower speeds.

In ships the problem of accommodating fan equipment in restricted space can, the author claims, be solved satisfactorily only by the use of screw fans, which take up literally no space at all when fitted with internal motors. The larger sizes are provided with split casings for ease in removal of motor and fan, and the smaller sizes are usually of the " drop in " type, the removal of which is very simple. The fans may be mounted on the weather deck or at a suitable level, and motors are usually totally enclosed, although advantage can be taken of the air-swept surfaces of the motors and fairings by having a corresponding fan-propelled internal air circuit to cause a high rate of heat dissipation from the motor, and so reduce the size of the carcase. Speed regulation down to about two-thirds of full speed is usually provided by the control equipment for the motor, this resulting in a 70 per cent. power saving when, as very often happens, the full air volume is not required.

Although the adaptability of this type of fan is its great attraction, economy in power is a double advantage where refrigeration is concerned, for not only does an efficient fan reduce the generator load, but the refrigeration necessary is reduced by exactly the heat equivalent of the power saved, as all the power expended in a fan eventually goes to heat up the air passing through it.

When the holds have also to be used for the carriage of meat in an atmosphere of 10 per cent. CO_2, it is necessary to mount the motor in a separate chamber outside the hold, and a gas-tight housing is formed by filling the shaft tube with grease. In the smaller sizes, these fans can conveniently be arranged as portable units mounted on an insulated plug, so that the whole unit may be withdrawn with the plug.

For mine ventilation the torpedo fan takes up less room and needs less power. For instance, one fan installed in Scotland taking 38 h.p. for 120,000 cu. ft. per min. has replaced a multi-bladed centrifugal fan needing 80 h.p. for an output of 45,000 cu. ft. per min.

The overloading feature of the screw fan is considered to be a very desirable characteristic in the case of tunnel ventilation.

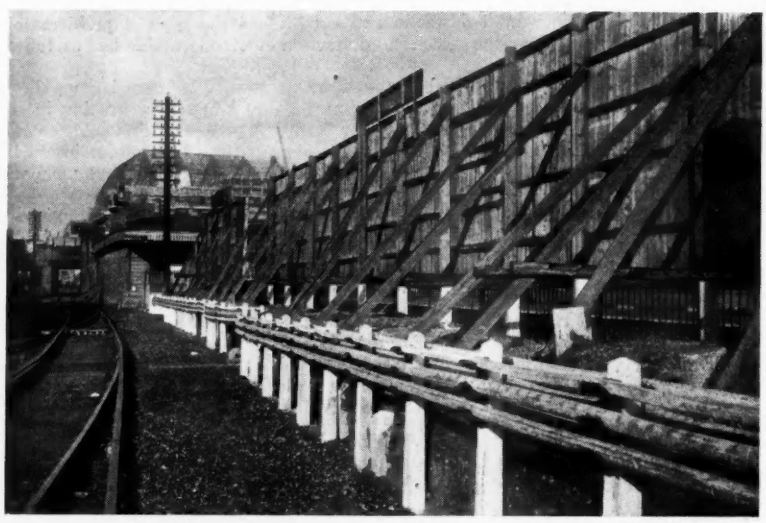
Power for Printing.—At the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 15th, Mr. W. Harvey opened a discussion on the application of electric power to printing presses. He used lantern slides to illustrate printing machinery of all types and sizes, emphasising the special features of electric drive and the particular difficulties due to the limitations of space. The high speeds of the machinery and the serious results of a failure of any kind were described, together with the special ingenuity required to deal with inching, crawling and extra smooth acceleration and deceleration that are essential with modern printing machinery. The difficulty of housing the very large equipment controlling the complicated mechanism of the plant and the provisions for eliminating dust and oil troubles were also dealt with.

Television.—At the last monthly meeting of the London Section of the INSTITUTE OF WIRELESS TECHNOLOGY, Mr. H. J. Barton-Chapple, chairman of the section, lectured on " High-definition Television." Receiver maladjustment was demonstrated, as was also interference caused by various types of electrical appliances, the lecture concluding with reception from the Alexandra Palace transmitter.

Railway Traction.—Before the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS on March 17th, Mr. E. T. Hippisley (Traction Department, British Thomson-Houston Co.) read a paper on electric railway traction, illustrated by lantern slides. Mr. Hippisley described briefly the type of electrical equipment employed in railway services on multiple-unit trains, explaining the technical choice of equipment suitable to a specific electrification scheme.

Progress at Earl's Court

THE new Earl's Court Exhibition buildings are now rapidly taking shape and the massiveness of the main building on its 9-acre triangular site renders the nearby Empress Hall almost insignificant by comparison. Work to provide for the anticipated electrical load of 12,000 kW is proceeding apace and W. T. Henley's Telegraph Works Co., Ltd., has just completed the cable installation to take the 11-kV supply from the Fulham Corporation's sub-station in Townmead Road. The cables employed comprise nearly 5,000 yd. of 0.25 sq. in., 3-core, 11-kV, paper-insulated and lead-covered cables with shaped conductors and over 7,500 yd. of 0.25 sq. in., 3-core, 11-kV paper-insulated, single wire, armoured and hessian taped, together with approximately 2,500 yd. of 3/.036 in., 44-core, low-voltage, paper-insulated and lead-covered pilot and telephone cable and nearly 4,000 yd. of 3/.036 in. similar cable with single wire armouring and hessian taped.



A run of Henley cabling conveying the 11-kV supply from the Townmead Road sub-station to the Exhibition buildings

Leaving the two outdoor transformers at Townmead Road the cables run in earthenware ducts as far as the West London Extension Railway and then for nearly 2,000 yd. alongside the railway track on cast-iron hangers supported by concrete posts. At West Brompton Station they are again laid in earthenware ducts for 320 yd. direct into the Empress Hall intake sub-station.

To provide the low-voltage supplies required five sub-stations are being provided at various points in the main buildings. They are in various stages of construction but most of the heavier plant, including the 1,500 and 200-kVA B.E.T. transformers and the Crompton Parkinson circuit-breakers, has been installed.

Good progress, too, is being made with the electric thermal storage system (see illustrations on next page), which is being carried out by Bastian and Allen, Ltd., for heating the building. The three 4,000-kW electrode boilers are now in position, as well as the seven huge storage tanks which measure 43 ft. by 11 ft. diameter and have a total capacity of 175,000 gals. The control of the electrode boilers will be effected from the Fulham Corporation's Townmead Road sub-station by means of the pilot cables mentioned above, and the charge engineer will adjust the load during the twenty-four hours according to the maximum demand of the undertaking and to the heat storage available in the cylinders at Earls Court.

Besides being an important factor in the reduction of heating costs, the total elimination of daylight from the exhibition areas will assure an even distribution and intensity of artificial lighting throughout and will enable the full beauty of what is described as " kaleidoscopic floodlighting " to be appreciated at all times of the day. This latter form of illumination which is now being fitted in the main hall roof, 200 ft. above the ground, will produce the effect of constantly changing rainbow colours and will be controlled by a thyratron valve made by the British Thomson-Houston Co., Ltd., who are also supplying special floodlights and " Mazda " lamps. The electrical contractors are Electrical Installations, Ltd.

I.E.E. Wireless Section Summer Meeting

The summer meeting of the Wireless Section of the Institution of Electrical Engineers will be held on May 29th, when a visit will be paid to the television station at Alexandra Palace.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Domestic Tariffs

I read the article "A Standard Domestic Tariff," by D. J. Bolton, in your issue of March 12th with very great interest. While agreeing with the author that his suggested block-rate tariff is neither scientific nor academic, I consider it is preferable to the rateable-value tariff as it is based on ordinary commercial principles and would, therefore, be more readily understood by the average consumer, who, after all, is the person we desire to satisfy and who generally has not a sufficiently expert knowledge to appreciate the scientific or academic tariff.

Mr. Bolton puts forward a block-rate tariff as an alternative to the usual two-part domestic tariff. Do we need alternatives? Do not the figures in the table published with Mr. Bolton's article, showing the multiplicity of rates in being, point to the need for reduction in the number of methods of charge? For my own part, I would like to advocate the abolition of all tariffs for domestic supplies, except that mentioned in the penultimate paragraph of Mr. Bolton's article, namely, the two-rate tariff. In a paper read before the E.P.E.A. Birmingham Technical Group in November, 1934, and again in an article in the ELECTRICAL REVIEW of January 17th, 1936, I discussed how long-hour use could be encouraged by charging a very low rate for all supplies taken outside the normal load hours of the undertaking, irrespective of the purpose for which the energy was used. The hours during which the low rate became operative could be varied according to local conditions or as those local conditions altered due to the growth of any particular type of load.

In other words, the two-rate tariff is variable with development and consequential alteration in system load characteristics. It is promotional, because it encourages the consumer to make the greatest use of the service at low load periods and the cost to the consumer decreases with a greater use during off-peak hours, and last, but not least, it has the merit of being easily understood.

Mr. Bolton confines his analysis of tariffs to undertakings selling more than the ten million kWh per annum used as the datum line of the McGowan Report. In 1934, when preparing an article upon the costs of electricity supply in this country, owing to the impossibility of making a detailed analysis of the statistics of 645 undertakings I decided to consider only figures relating to undertakings selling ten million or more units. At that time undertakings falling within this category comprised 23 per cent. of the total number operating and sold 78 per cent. of the total number of units consumed. These figures have now increased to 27 and 90 per cent., respectively, an indication of the trend of events during the two years which have elapsed.

F. S. ELLIOTT.

Wolverhampton, *March 17th.*

Telephone Work in China

It may interest your readers to know that the "Nine Provinces" telephone scheme, the Shanghai-Canton radio scheme and the Canton-Hong Kong cable mentioned in my contribution to the ELECTRICAL REVIEW of January 8th last were all manufactured in London by Standard Telephones and Cables, Ltd., although the associated company, the China Electric Company, carried out that part of the work described which was done in China.

I am informed that the China Electric Company has nothing to do with the Bell Telephone System, or the American Telephone and Telegraph Company of the United States. It is an associated company of the International Telephone and Telegraph Corporation, which is qute independent of the Bell System. Unfortunately, my Chinese informant believed that the China Electric Company was associated with the Bell Telephone System. That statement also appeared in a semi-official Chinese publication.

It is very encouraging for those of us interested in engineering developments in China to know that there is now an F.B.I. China Trade Committee, and it is to be hoped that British engineering firms will benefit by its work. Chinese student apprentices should be encouraged to obtain practical experience in Great Britain.

C. A. MIDDLETON SMITH,
Taikoo Professor of Engineering.

Hong Kong, *February 15th.*

The E.I.B.A. Annual Luncheon

It is not generally known that ladies will be very welcome at this luncheon at the Savoy Hotel on April 9th, and it has been suggested that I should seek your assistance in making it public. It may have the effect of a number of wives of electrical men insisting on coming with their husbands.

A. HUGH SEABROOK,
Executive Officer,
Electrical Industries Benevolent Association.

London, W.C.1, *March 19th.*

Consumers and Earthing

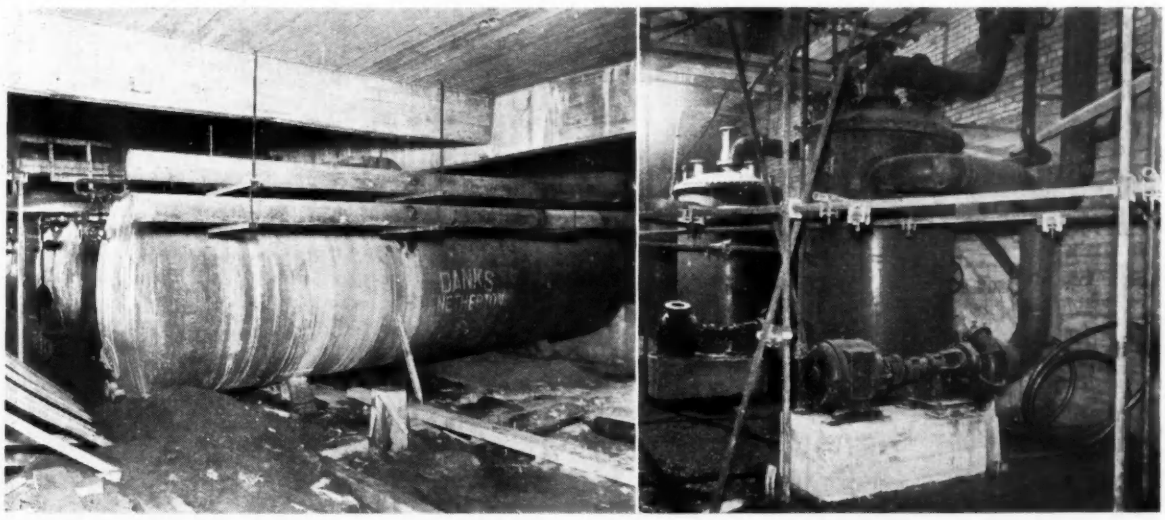
Further to Mr. John Bland's remarks on this subject, with which, of course, every electrical contractor will be in hearty agreement, what is the use of a really first-class installation while the users of such installations are able to go to the nearest store and for a few shillings provide themselves with any number of accessories any one of which is a prospective source of fatal shock?

To my mind the only remedy for this sort of thing is to exercise some sort of control over the manufacture and import of such appliances. The sale of flex, plugs and bayonet adaptors to the public should be definitely barred. A member of the public is not allowed to buy dangerous drugs for the compounding of medicine, why should he be allowed to buy items for the compounding of an electrocution?

E. W. DEVENISH.

Berwick-on-Tweed, *March 20th.*

[Mr. A. W. Gosst asks us to point out that the figure of 18 deg. C. included in his letter on "Discharge-lamp Operation" in our last issue should have been −18 deg. C.—EDS. ELEC. REV.]



[Elec. Rev. photo.

A tube train could pass through each of the seven thermal-storage cylinders at Earl's Court Exhibition shown on the left. These are supplied from three 4,000-kW Bastian & Allen electrode boilers (right) (See preceding page)

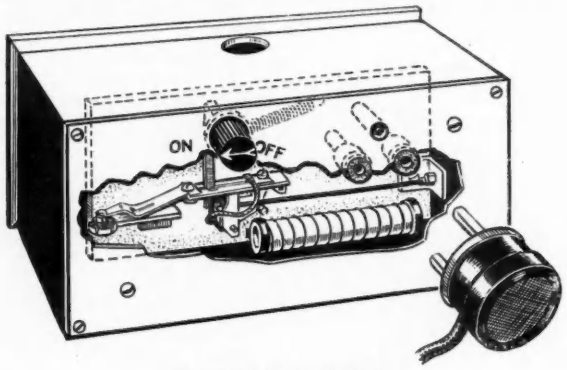
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Unusual Circuit-breaker

A small circuit-breaker designed on new lines has been introduced by the COMBI ELECTRIC CO., LTD., 85, Cromwell Road, London, S.W.7. The inherent difficulty with the bi-metallic strip method of operation is the time lag, while the magnetic type is too rapid in operation to withstand electric motor starting currents.

The new Combi breaker is operated by means of a strut element that can be made in very small sizes, and it heats up

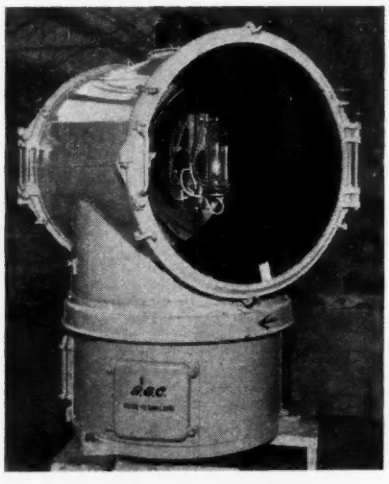


The Combi circuit-breaker

rapidly, the expansion operating the trip. In this way it is possible to obtain rapid action while retaining the advantage of a true inverse square ratio time lag on small overloads. The mechanism is so designed that it cannot be held against an overload or reset when there is a fault on the circuit. The main contact is protected from pitting or burning by two stages of auxiliary contact surface. When the breaker opens the three points of contact separate successively, the final break being made on carbon. By this arrangement any arcing taking place across the metallic points of contact due to the high resistance of the carbon is taken up by the auxiliary metallic point, leaving the other at all times clean and free from pitting or burning. In the closed position the carbon contact is out of circuit. Although 5 and 15A models are to be made, the present size is rated at 2A (max.) with a maximum breaking capacity of 500 A at 250 V.

Course indicating Aerodrome Beacon

Airway beacons are usually arranged to flash, because by so doing it is possible to obtain a sufficiently intense light from a lamp of reasonably small power. The new beacon made by GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, resembles a rotating searchlight, the beam from which sweeps round and shows a flash to every position round the beacon in turn, once in each revolution.

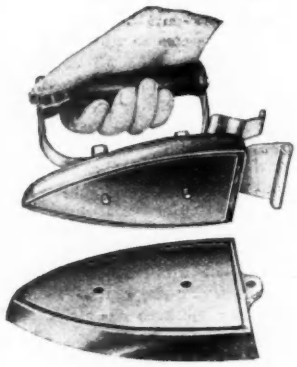


A G.E.C. aerodrome course-indicating beacon under construction

If the beacon is to give an indication of direction, means must be provided of flashing some sort of code, which shall be different in various directions, so that the pilot will know whether he is approaching the beacon on his proper course, or merely crossing the route at an angle. In the G.E.C. beacon this is accomplished by arranging that over some directions near the true course the flash shall be obscured during certain revolutions of the beacon. By revolving a small shutter round the lamp at predetermined moments and speeds during the rotation of the beacon, the same effect can be produced as if a large shadow bar were erected for a moment in front of the beacon and removed again when the beam has passed. This scheme will only operate with the special optical system used in this beacon, which has a large mirror parabolic in one section and elliptical in another, and also a specially designed refractor. Two shutters are moved at the right moments by a system of gearing. Special codes show whether the pilot is within 3 deg. of his course, other indications being given for between 3 and 18 deg. to the left or right, and also over 18 deg.

Variable-weight Iron

The advantage of having different weight irons for various fabrics is obvious. By the use of three detachable sole plates which are supplied the weight of the "Composite" electric iron (Betts patent) marketed by WOOD, RUSSELL & CO., LTD., can be 4¼, 5¼ or 6¼ lb. In the change, which is made by means of two thumb screws, no part of the interior is exposed and even if carried out while still in circuit no harm could occur to the user.



The "Composite" iron

A new principle involved in the construction of the heating element is claimed to reduce electricity consumption, and at the same time effect a more even distribution of heat throughout the body of the iron, even to the tip. The iron is also said to have good heat retaining qualities. It has a loading of 400 W.

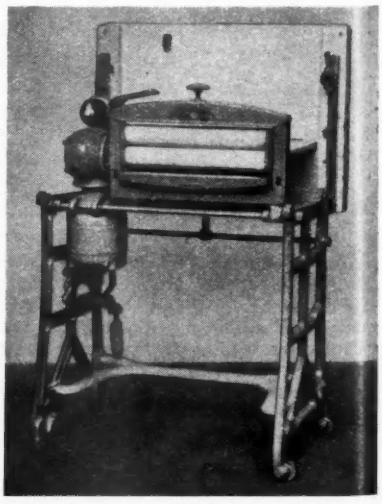
Moulded Slip-rings for Motors

As a result of two years' research BROOK MOTORS, LTD., Empress Works, Huddersfield, have produced a slip-ring assembly moulded in one piece. The phosphor-bronze current rings, the only metal in the construction, are firmly embedded in an insulating material mechanically strong and with high dielectric properties. The nearest earthable point is nearly two inches away, and the rings are guaranteed not to crack or track electrically. The complete moulding with rings is dynamically balanced before assembling on the motor. These new slip-rings are fitted as standard on all Brook slip-ring motors up to 15 h.p., and will shortly be fitted on all machines up to 125 h.p.

Electric Clothes Wringer

A clothes wringer of the folding table-top type has been designed by W. & S. SUMMERSCALES & SONS, Parkside Works, Keighley.

It is known as the "Quicktric," the conversion from table to wringer being accomplished by releasing a patent spring-lifting device which balances the wringer; a ¼ h.p. motor drives the soft rubber rollers. The motor can be started in either forward or reverse direction by means of a rotary switch mounted above the motor on an extension of its casing. The table-top forms a splash-back when raised for wringing, the measurements being 32 in. by 22 in.; a totally enclosed "Mandressa" unit measuring 36 in. by 23 in. can also be obtained. Both are 31¼ in. high. "Vitrex" mottled green enamel is the standard finish, but mottled blue or grey can be obtained to order. Three yards of heavy three-core c.t.s. cable is provided and the frame is fitted with four castors.



The "Quicktric" clothes wringer

United Kingdom Electrical Imports

Countries of origin

THE annual statement of the import trade of the United Kingdom in 1935 has recently been issued by the Stationery Office. It gives in greater detail than the monthly returns the imports of electrical appliances and machinery, together with the principal countries of origin. These particulars have been extracted in the following statement, a note of increases or decreases compared with 1934 being added. As a whole the electrical import trade increased during the period under review by only about £130,000, of which 75 per cent. represented vacuum cleaners chiefly from Canada.

Of the electrical machinery imported during the year under review, totalling just over £600,000, the share of the United States was £185,000, Canada (mainly vacuum cleaners and parts) £130,000, and Germany £57,000. To the imports of wire and cable, wireless material, lamps and electrical goods and apparatus other than machinery, totalling £3,090,000 in value, Germany's contribution was £520,000, and that of the United States £745,000 (largely radio apparatus).

	1935 £ (000)	Inc. or dec. on 1934 £ (000)
Telegraph and telephone wires and cables (not submarine)—		
Total	5	+ 1
Wires and cables, rubber insulated (not telegraph or telephone)—		
Total	118	+ 22
From Germany	55	+ 11
„ Belgium	40	+ 15
Wires and cables, insulation other than rubber (not telegraph or telephone)—		
Total	74	— 28
From Germany	37	— 9
„ Holland	16	— 7
„ Belgium	5	— 7
„ Switzerland	11	— 2
Wires and cables, paper insulated—		
Total	42	+ 13
From Belgium	35	+ 13
Radio receiving sets (except valves)—		
Total	254	— 32
From United States	240	— 34
Radio transmitting apparatus (except valves)—		
Total	22	+ 13
Radio valves—		
Total	195	— 20
From Holland	28	— 17
„ Austria	47	— 20
„ United States	105	+ 37
Other radio parts and accessories—		
Total	713	+ 53
From Holland	380	— 28
„ United States	211	+ 73
„ Canada	13	— 11
„ Switzerland	15	— 6
Other telegraph and telephone instruments and apparatus—		
Total	63	+ 9
From Germany	23	+ 4
„ Belgium	17	— 1
„ United States	7	+ 2
Lighting carbons—		
Total	2	— 12
From Germany	2	— 9
Furnace carbons—		
Total	69	+ 1
From Canada	60	+ 3
Lamps, 20 V and over, gas-filled—		
Total	23	— 5
From Japan	5	— 11
Other lamps, 20 V and over—		
Total	22	— 34
From Japan	8	— 33
„ Holland	11	+ 2

	1935 £ (000)	Inc. or dec. on 1934 £ (000)
Lamps, under 20 V, for motor vehicles—		
Total	44	+ 13
From Japan	14	—
Bulbs for flashlamps—		
Total	29	— 24
From Japan	20	— 20
Lighting appliances, unspecified—		
Total	246	+ 11
From Germany	106	+ 1
„ Holland	71	+ 13
„ United States	11	— 14
„ France	11	+ 4
Batteries, primary, for flashlamps—		
Total	1	—
Other primary batteries—		
Total	4	— 2
Accumulators, portable—		
Total	3	—
Accumulators, stationary—		
Total	6	+ 1
Electric bell apparatus, not telegraphic or telephone—		
Total	28	+ 4
From Germany	24	+ 3
Ammeters, voltmeters, etc.—		
Total	50	+ 4
From Germany	6	— 1
„ Switzerland	27	+ 10
Scientific electric instruments—		
Total	92	+ 9
From United States	44	+ 18
„ Germany	24	— 9
House service meters—		
Total	30	— 9
From Germany	27	— 10
Parts of house service meters—		
Total	106	— 20
From Switzerland	62	— 10
Cooking and heating apparatus—		
Total	142	+ 64
From United States	89	+ 50
„ Canada	32	+ 16
Insulating materials—		
Total	112	— 4
From Germany	50	— 17
„ Switzerland	25	+ 4
Electro-medical apparatus (other than X-ray tubes and vacuum tubes)—		
Total	81	+ 23
From Germany	53	+ 20

	1935 £ (000)	Inc. or dec. on 1934 £ (000)
X-ray tubes and vacuum tubes—		
Total	55	+ 7
From Germany	28	+ 6
Electrical goods and apparatus, unspecified—		
Total	230	— 45
From Germany	85	— 12
„ Holland	9	+ 1
„ France	64	+ 2
„ Switzerland	14	— 4
„ United States	38	— 18
„ Canada	4	— 3
Generators, above 200 kW—		
Total	8	— 14
Generators, not exceeding 200 kW—		
Total	11	+ 5
Motors (other than railway and tramway) above 250 h.p.	2	—
Motors (other than railway and tramway) 1–250 h.p.—		
Total	142	+ 20
From Sweden	51	+ 21
„ Germany	24	+ 1
„ United States	48	— 6
Motors (other than railway and tramway) under 1 h.p.—		
Total	96	+ 37
From Canada	20	+ 13
„ United States	67	+ 22
Convertors and transformers—		
Total	26	+ 9
From Germany	13	+ 6
Switchgear—		
Total	18	— 33
From Sweden	4	— 31
Motor starting gear and control gear—		
Total	7	+ 4
Vacuum cleaners and parts—		
Total	248	+100
From Canada	110	+ 68
„ Sweden	38	— 13
„ Germany	14	+ 3
„ United States	61	+ 37
Electrical machinery not elsewhere specified—		
Total	42	— 23
From Germany	6	— 5
„ France	13	— 11
„ Sweden	5	+ 4
„ Switzerland	2	— 1
„ United States	8	— 9
„ Canada	2	—

Egypt's Electrical Imports

AFTER the substantial advance in Egypt's electrical imports between 1934 and 1935 a set-back occurred last year. The total of machinery, apparatus and other electrical goods was then £E665,000 (Egyption £ equals £1 0s. 6d. approx.) as compared with £E830,000 in 1935 and £E680,500 in 1934. From the following statement, which has been extracted from the recently published official returns, it will be seen that a decline took place in the majority of the groups. In fact increases were shown only in the cases of dry batteries and parts, electro-medical apparatus, insulated tubes, domestic apparatus (except refrigerators), and unspecified equipment, the last-named being the largest class. The rise in imports of domestic apparatus is significant of a new trend which may continue. With regard to future business generally a fairly optimistic view was expressed by the Governor of the Bank of Egypt at the annual meeting in March. He estimated that cotton cultivators received about £3,500,000 more for their crop last season than in the previous one. An appreciable increase in national purchasing power, he said, was indicated by higher savings deposits.

But some significance attaches to the drastic change which took place last year in Egypt's trade balance. The export surplus then was only £E1,463,000 as compared with £E3,454,000 in 1935.

	1936. £E.	Inc. or dec. on 1935. £E.
Generators, motors and transformers, 1,000 kW. or over—		
Total	21,800	— 21,200
From United Kingdom	4,300	— 2,700
„ Germany	10,000	— 5,000
Ditto, 50 to less than 1,000 kW.—		
Total	83,000	— 18,000
From United Kingdom	9,400	— 6,600
„ Germany	7,700	+ 100
Ditto, less than 50 kW.	11,600	— 2,000
Dry batteries and parts—		
Total	18,800	+ 1,200
Accumulators and parts—		
Total	24,200	— 4,500
From United Kingdom	9,700	— 8,000
„ Germany	4,500	+ 1,300
„ United States	5,500	+ 800
Fans, electric—		
Total	5,200	— 1,300
Wireless valves—		
Total	7,800	— 2,600
Electro-medical apparatus—		
Total	34,000	+ 13,400

	1936. £E.	Inc. or dec. on 1935. £E.
Electric lamps—		
Total	41,000	— 6,000
From United Kingdom	4,300	+ 200
„ Germany	4,700	— 800
„ Holland	18,400	+ 400
„ Hungary	5,100	— 4,200
„ Japan	2,500	— 2,100
Telegraph and telephone apparatus—		
Total	27,600	— 41,600
Radio receiving sets—		
Total	107,000	— 69,000
From United Kingdom	12,500	+ 4,600
„ Germany	9,600	— 400
„ Holland	20,700	— 45,300
„ United States	57,000	— 26,000
Submarine and underground insulated cable—		
Total	53,200	— 8,800
From United Kingdom	3,800	— 2,700
„ Belgium	12,800	— 3,600
„ France	7,500	+ 2,500
„ Germany	26,300	+ 3,600

	1936. £E.	Inc. or dec. on 1935. £E.
Other insulated wire and cable—		
Total	36,000	— 1,600
From United Kingdom	5,500	— 5,200
„ Belgium	10,800	+ 3,200
„ Germany	13,700	+ 1,100
Insulated tubes, wire gal-covered—		
Total	7,500	+ 1,400
Domestic irons—		
Total	800	+ 200
Refrigerators—		
Total	3,100	+ 100
Water heaters	800	— 1,100
Other domestic apparatus—		
Total	11,000	+ 600
Electrical apparatus not specified—		
Total	193,000	+ 4,000
From United Kingdom	53,000	+ 1,000
„ France	22,000	— 11,300
„ Germany	65,000	+ 11,300
„ Switzerland	6,000	+ 1,000
„ United States	15,000	+ 4,000

Parliamentary News (BY OUR SPECIAL REPORTER)

Power Bills

The Kent Electric Power Bill was read a second time in the House of Commons on March 18th. The North Metropolitan Electric Power Supply Bill received its third reading in the House of Commons on the same day.

The Battersea Extension

On March 17th Mr. H. Williams asked the Minister of Transport whether he had received any report from the Chief Government Chemist in respect of the purification of the flue gases from the Battersea station of the London Power Company; whether there was any objection to the extension of this station, and when the Electricity Commissioners' decision in respect of the application for extension would be made.

Mr. Hore-Belisha said that a report had been received from the Government Chemist; the application was now being considered by the Electricity Commissioners.

Sir P. Dawson asked the Minister for the Co-ordination of Defence whether he was aware that it was proposed largely to increase the Battersea power station of the London Power Company; and what steps were proposed to be taken to guard against the danger in case of war due to the number of vital power stations situated on the Thames in such relatively close proximity as Dagenham, Deptford, Blackfriars, Battersea, Lots Road and Chelsea.

Sir T. Inskip said that the proposed extension of Battersea power station was before the Electricity Commissioners for their consent, and he was not in a position to make any statement. As regarded the second part of the question, he had referred in past debates to the work which was constantly in progress to ensure the proper defence of important services. This included measures, active and passive, for safeguarding electricity supplies from stations on the line of the Thames.

London Trolley Buses

Sir David Reid's Committee of the House of Commons which is considering the London Passenger Transport Board Bill decided on March 17th to assent to trolley buses using the Victoria Embankment.

Mr. Frank Pick, vice-chairman of the Board, told the Committee of an interview he had the previous evening with his chairman, Lord Ashfield. The view of Lord Ashfield was that from the point of view of dealing with traffic they must claim to understand what was needed. For the efficient working of the services a turning place on the Embankment was essential. Lord Ashfield would not go so far as to say that if turning points were not allowed they would not run trolley vehicles. In those circumstances they would try to make the service a success, reserving the right to come back to Parliament later and ask for turning places.

The chairman said that in view of the convenience of people living in South London the Committee had decided with great reluctance to assent to trolley buses. It had, however, also decided that Clause 6 which gives the right to apply to the Ministry of Transport to sanction turning places should not apply to the Embankment.

In the Courts

Compensation Award

In the King's Bench Division last week the hearing was concluded before Mr. Justice Talbot and a common jury of an action brought by Miss Joan Stubbs, of Deptford, S.E. (suing by her father), to recover from Siemens Bros. & Co., Ltd., damages for personal injuries sustained by her on December 16th, 1935, whilst working for the company on a machine for the manufacture of telephone parts at its Woolwich factory. Miss Stubbs, who was then 15 years of age, was operating a capstan lathe when her right hand got caught between the belt and cone pulley, with the result that her hand was seriously injured and half of the middle finger of the hand had to be amputated. The hand therefore, as it was alleged, became practically useless.

Miss Stubbs alleged that the accident was due to the negligence of the defendants in allowing her to work on machinery which was in a dangerous or defective condition and in failing to properly fence or guard the lathe, in causing her to operate it when the starting handle was stiff and not in a safe and proper working order, and in having to stand and work on a floor which was in a greasy or slippery condition. In failing to properly fence or guard the lathe Miss Stubbs alleged that the defendants had been guilty of a breach of their statutory duties imposed under Section 10 of the Workshop and Factory Act, 1901.

The defence was a denial of negligence and that there had been any breach of defendants' statutory duty. Defendants further alleged that the plaintiff had been guilty of contributory negligence in preparing to insert a length of brass tubing in the capstan lathe without stopping the machine.

In the result the jury returned a verdict for Miss Stubbs and awarded her £1,000 damages and judgment was entered accordingly with costs. It was stated that the damages would be paid into the Greenwich County Court and that defendants would defray the hospital charges.

Wrongful Consumption of Electricity

At Dukinfield on March 18th Sydney Smith, of Dukinfield, was summoned by the Stalybridge, Mossley, Hyde and Dukinfield Joint Electricity Board for using electricity supplied for domestic purposes for another purpose, *i.e.*, for charging batteries. The case was brought as a warning to others in the Board's area. It was stated that defendant became a consumer of electricity for domestic purposes at the all-in tariff, paying 9s. per quarter on rateable value and ½d. per kWh for electricity consumed. An employé of the Joint Board took to defendant a battery to be charged and paid threepence.

Defendant said that he had been charging batteries for fourteen months, but the most he received in a week was 3s. 9d. The charge for electricity for battery charging was 2½d. per kWh. Defendant said that he had charged batteries as a hobby and had done it free for unemployed men.

He was fined £3 and two guineas advocate's fee. The Court did not make an order for the payment of £5 9s. 8d., the difference between the two rates.

Fishing Rights on the Shannon

The Irish Free State Electricity Supply Board was successful in obtaining an interlocutory injunction against a number of Castleconnell fishermen who had entered on the waters of the Shannon for the purpose of taking salmon. The injunction was granted by Mr. Justice Gavan Duffy, president of the High Court, Dublin. The E.S.B. now owns a great deal of the Shannon, retaining the rights of the several fisheries in operation before the Board took them over. There has been intermittent trouble with fishermen entering the fisheries.

New Books

An Introduction to Neon Lighting. By J. ORR and A. W. FORREST. Pp. 80; figs. 37. London: Blackie & Son, Ltd. Price 3s. 6d.

Seldom does one expect to find a book bearing the modest title of an "introduction" to its subject that is anything more than a brief survey. This book differs in many respects from the usual work of this nature, and in view of the small quantity of literature available on neon lighting it is welcome.

The work opens with a free treatment of manufacturing processes, and covers workshop practice lucidly without attempting to dwell in detail on design. A brief explanation of the functioning of a neon tube follows, leading to such matters as power-factor correction. The section on the difference between current and voltage wave forms in a.c. supplies is worthy of special mention. This subject has been treated in a very interesting manner, and the use of diagrams and the avoidance of intricate mathematical calculations make it easy for even the lay mind to appreciate the reason why electricity supply undertakings insist upon power factor correction. On account of this chapter alone, the book should make a strong appeal to neon salesmen as well as those generally interested in the subject.

Descriptions of transformers and diagrams of a.c. and d.c. wiring give the reader more than a general idea of this part of a neon installation, and under the heading of "Maintenance," the authors have given an interesting description of the faults which at times occur in neon signs. One of the six chapters is allocated to details of pumping and filling plant, but amplification of the section dealing with flashing signs would have been an advantage.

The work should be in the hands of all interested in displays produced by the use of gaseous discharge tubes.

The Electrical Encyclopedia. (Four volumes.) Edited by S. G. B. STUBBS. Pp. 1,440; figs. 1,916. London: Waverley Book Co., Ltd. Price 70s. per set.

The first edition of this comprehensive and well-arranged reference book was published just over two years ago. In reviewing it we expressed the opinion that the "working electrician," for whom it was ostensibly designed, must be regarded as including everyone in our industry, as the articles, although elementary in character, are by no means superficial, written as they are by authorities on their subjects. Items appear in alphabetical order and an efficient system of indexing and cross-references enhance the general utility of the work.

In this, the second, edition, matter appearing in the original publication has been brought up to date, such as that relating to heaters and heating, hot-cathode lamps and lighting, while new articles include information on pyrometers and television. A pocket book of sixty-six pages (6 in. by 4¼ in.), which appears to cover all requirements in the way of tables required in practice, is presented with the volumes.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

B.E.A.M.A. Annual General Meeting

The report for 1936 of the British Electrical and Allied Manufacturers' Association was reviewed in our last issue (page 429). It was presented at the annual general meeting on March 18th, the chairman of the Council, Mr. E. S. New, presiding. The report and accounts were adopted, and the results of elections to the Council were announced by the chairman as follows:—Brookhirst Switchgear, Ltd.; Brush Electrical Engineering Co., Ltd.; Hick, Hargreaves & Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Micanite & Insulators, Co., Ltd.; Mirrlees Watson Co., Ltd. At the subsequent meeting of the new Council Mr. J. L. Wilson was elected chairman and Mr. E. S. New vice-chairman of the Association for the session 1937-38.

Employment in February

Employment in the engineering industry during February improved and was good on the whole, and remained very good in electrical engineering. The *Ministry of Labour Gazette* states that the total out of work in the engineering industry was 61,837, or 5.8 per cent., a decrease of 0.5 per cent. as compared with January, and of 4.2 per cent. as against February, 1936. In the electrical engineering section the number of unemployed was 3,656, or 3.6 per cent. (5.7 per cent. in February, 1936). The unemployed in the electrical wiring and contracting industry numbered 4,044, the percentage rising from 10.3 to 10.6, as against 14.9 per cent. in February, 1936. In the electric cable, apparatus, lamps, &c., group the unemployed increased from 9,594 to 9,678, or 6.4 per cent., as against 10.3 per cent. in February, 1936.

Belgian Foreign Electrical Trade

The following table shows the Belgian imports and exports of electrical machinery, apparatus and cognate goods during 1936 as compared with the preceding year. The values against the separate items are in thousands of Belgian francs, while for purposes of comparison the total in sterling at 143½ fr. to the £ has been added.

	Imports.		Exports.	
	1935. 1,000 fr.	1936. 1,000 fr.	1935. 1,000 fr.	1936. 1,000 fr.
Dynamo-electric machinery...	51,222	56,287	19,904	22,830
Dry batteries	4,913	4,450	159	213
Accumulators and parts ...	2,179	1,933	2,488	3,383
Magnets (other than electro-magnets)	1,504	2,238	—	12
Land and submarine cables...	1,086	1,117	27,034	39,214
Insulated wires and cables ...	13,695	14,414	28,750	42,928
Copper wire and cables (not insulated)	281	602	1,439	4,769
Carbons and electrodes ...	4,818	7,515	87	104
Porcelain insulators, etc. ...	1,776	1,703	347	389
Electric globes, bulbs and glassware	6,759	8,113	6,026	8,555
Insulating tubes, junction boxes, etc.	5,466	3,878	1,452	1,747
Other insulating material ...	3,576	3,149	247	417
Arc lamps	130	170	4	2
Incandescent lamps	18,766	19,894	13,216	14,578
Radio valves	33,712	31,375	935	1,859
Electric measuring instruments	17,085	18,481	1,299	1,532
Telegraph and telephone apparatus	3,913	4,839	75,339	79,325
Wireless transmitting and receiving apparatus	18,005	14,896	5,690	7,619
Wireless sets, not assembled	3,727	2,151	8,391	13,602
Wireless loud speakers and microphones	6,830	5,183	4,295	4,951
Wireless parts	18,913	17,008	531	1,251
Other electrical apparatus and goods	123,283	135,556	23,710	17,083
Total fr.	341,639,000	354,952,000	221,643,000	266,453,000
Total sterling at 143½ fr. to £	£2,380,760	£2,473,533	£1,544,550	£1,856,815

Derby Cables to Join C.M.A.

Crompton Parkinson, Ltd., announce that their associated company, Derby Cables, Ltd., is to become a member of the Cable Makers' Association as from April 1st. From that date cables to C.M.A. standards and formulæ will be marketed in accordance with the agreed policy, prices and conditions of sale of the Association.

Manufacturers' Agents' Association

The annual general meeting of the Manufacturers' Agents' Association of Great Britain and Ireland (Inc.) was held at Southern House, Cannon Street, Station, E.C.4, on March 16th. The chair was occupied by the president, Alderman J. Joy, who outlined the benefits of the Association and the great amount of work involved in connection with it. He emphasised the great need for more members. Railway facilities, debt collecting, settlement of disputes with manufacturers, status inquiry information, legal advice, agreement forms, arranging office accommodation, &c.; all this and more was undertaken by the Association for the benefit of its members. He stressed the fact that there were still many districts in which there were few or no available members and for which the Association received inquiries for the appointment of agents. The question of delays and difficulties to which agents are subjected by Customs officials in connection with goods consigned from abroad was very fully discussed, as also was the possibility of assisting the widows of agents who had spent a lifetime working up a good connection for the benefit of their manufacturers.

"Northmet" Hatfield Showrooms

In October, 1923, the North Metropolitan Electric Power Co. commenced the supply of electricity to Hatfield House, and in the following month a supply was commenced to Hatfield town itself. Since that date steady progress has been maintained and at the end of last year there were 1,500 consumers with a total consumption of nearly 2,000,000 kWh during the year. The company has now provided a showroom for the convenience of electricity users in the district, and this was opened on March 18th by Mr. E. T. Tingey, chairman of the Parish Council. In view of the fact that Hatfield represents the most convenient centre to the company's northern area, which extends to Hitchin, Stevenage and Royston in the north, Bishop's Stortford and Hertford in the east and St. Albans and Harpenden in the west, provision has been made in the premises for an area office. Accordingly, the upper floor of the premises consists of offices set aside for the area officials, including specialists on electro-farming and water heating. The showroom itself on the ground floor is arranged to demonstrate the many applications of electricity in the home. There is a lecture room for weekly cooking demonstrations and for other demonstrations which will be given from time to time. Electric cookers, washing machines, refrigerators and other kitchen equipment are on view. Visitors will note that the windows on the ground floor are arranged so that they may be as effective by night as by day and the lighting arrangement is on modern lines, unobtrusive yet effective. At the rear of the premises there is a small workshop for repairs to consumers' apparatus. The heating of the offices and staircase is by by means of thermostatically controlled electric hot water radiators.

The exterior of the new Hatfield showrooms of the "Northmet" Company

A Window-dressing Competition

Siemens Electric Lamps and Supplies, Ltd., inform us that their "Full O'Power" batteries are included in section 3 of the *Daily Mail* "Show and Sell" contest, particulars of which were given in our last issue, and the company is prepared to supply display material to dealers who enter. In addition to the prizes offered by the *Daily Mail* Siemens are offering additional prizes to the value of £50 to dealers giving the best window display of "Full o' Power" radio batteries.

B.S.S. for Worm Gearing

The British Standards Institution has issued a specification for worm gearing comprising correctly generated worm wheels and profile-ground worms, connecting shafts at right angles, and having a normal pressure angle of worm thread of 20 deg. of the following classes:—(A) Precision gears for wheel pitch line speeds above 1,000 ft. per min. (B) High-

class gears for wheel pitch line speeds below 1,500 ft. per min. (C) Commercial gears for wheel pitch line speeds below 300 ft. per min.

Social Events

The annual staff dance of London Associated Electricity Undertakings, Ltd., was held at the Georgian Hall, Harrods, on March 12th, when a large gathering of the staff attended. Among the directors who were present were Messrs. C. Parker, J. S. Highfield, W. R. Davies, R. H. Cale, J. A. Gatti and Major A. L. Trundle. Dancing was interspersed with an excellent cabaret entertainment.

Councillor W. Lowe, chairman of the Westhoughton U.D.C., opening the local L.E.P. exhibition. Mr. C. D. Taite, chief engineer and general manager of the company, is seated in the centre

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the March 1st cost-of-living figure (51 per cent. above the 1914 level) will not involve any alteration in the wages of workers in the industry on the third pay day in April.

Czechoslovakian Journal's International Number

Articles in English on the accurate current diagram of the induction motor by Ing. Dr. L. Cigánek and the time-sweep relay and the high-frequency oscillator of the oscillograph of the Skoda works by Ing. Dr. Josef Nemec appear in the fourth international number of the *Elektrotechnicky Obzor* (Prague).

For Sale

Stretford and District Electricity Board and the Clacton Electricity Department both have for sale d.c. motors.

Heston and Isleworth Council has obsolete electricity meters for disposal.

(See our classified advertisements.)

L.E.P. Sales Activities

The Lancashire Electric Power Co. has just concluded a programme of nine electrical exhibitions with one held last week at Westhoughton, an isolated mining centre some miles from Bolton. In spite of the depressed state of the district, good business was obtained, and keen interest was displayed in the films screened and the demonstrations of cooking and washing. The exhibition was opened officially by Councillor W. Lowe, chairman of the Westhoughton U.D.C., who was welcomed by Mr. C. D. Taite, chief engineer and general manager of the L.E.P. Co. Mr. Taite said that, in spite of local conditions, Westhoughton, so far as electricity was concerned, led a very large number of townships throughout the country. Of the houses in the district more than 90 per cent. were taking a supply. Councillor Lowe spoke of the early days of electricity in Westhoughton, and recalled how as a schoolboy 30 years ago he watched the first cables being laid. The eight earlier exhibitions were held at Ormskirk and Mawdsley, in the western part of the company's area; Leyland; Tyldesley and Astley, both coal mining districts; Tottington, a rural and residential area near Bury; and Boothstown, Little Hulton, Stoneclough and Kearsley, all separate townships some miles from Bolton. After Easter a new spring series of exhibitions commences, starting with one at Ainsworth.

Trade Announcements

Ensign Lamps, Ltd., Preston, announces that it has purchased an additional factory, which will ensure full supplies of its pearl and clear lamps to all trade customers.

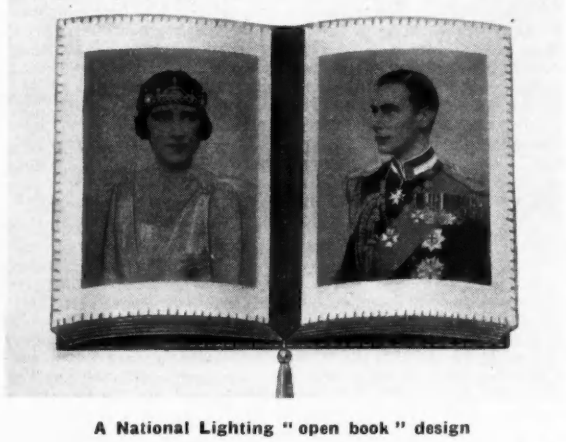
Marryat & Scott, Ltd., have removed their Midland office to 271, Hagley Road, Birmingham (telephone Edgbaston 1590). The branch will continue under Mr. B. P. Hutton.

Durex Abrasives, Ltd., has removed its London sales office to Thames House, Millbank, S.W.1.

Owing to increased volume of business Fitter & Poulton, Ltd., Vincent Parade, Balsall Heath, Birmingham, have found it necessary to make further additions to their works. The telephone number is now Calthorpe 1151-2.

Household Coronation Devices

MANY private householders and small shopkeepers will doubtless welcome the opportunity of participating in the Coronation illuminations offered by a special range of low-priced devices available from the General Electric Co., Ltd.



A National Lighting "open book" design

A set of twelve "Osram" red, white and blue decoration lamps, similar in shape to the company's Christmas tree lamps, is now available packed in a carton complete with red, white and blue holders, flex, adaptor and spare bulb.

These are employed in two cut-outs, a crown and a Royal monogram, both of gold papier mâché, and the little lamps give a realistic appearance of shining jewels.

For window sill use there are two neat illumination boxes, one with a luminous front panel carrying the Royal monogram with a papier mâché crown behind it; the other is a flag box with three standards, which are set in an 18-in. trough with a luminous front panel for housing red, white and blue lamps.

A 12-lamp outfit specially designed by the British Thomson-Houston Co., Ltd., produces a pleasing effect by means of non-inflammable translucent shades in red, white and blue, the white shade bearing a portrait transfer of Their Majesties. A bead device enables each lampholder to be separately and securely fixed.

Primarily intended for shop-window use, an open book design of "Pearlite" vellum bearing coloured transparentised portraits of the King and Queen is a novelty produced by the National Lighting Co., Ltd., 19, St. Bride Street, London, E.C.4. The device, which measures 20 in. by 11½ in., has a gold border and is finished with blue ribbon and gold tassel. A somewhat similar screen, with a crown and laurel design, is 28 ins. wide by 23½ ins. high. The company is also marketing a range of lampshades, two cylindrical types with portraits of Their Majesties separately being particularly effective.

Special G.E.C. equipment for the private householder and small shopkeeper

Finnish Electrical Trade

Statistics of the past year's imports of electrical goods into Finland show an increase of 1,600 tons or 40 per cent. in quantity, as compared with 1935, or £110,000 (30 per cent.) in value. The following figures show the imports in weight for 1935 and 1936 :—

	1935.	1936.
Electrical machines	1,711 tons	3,042 tons
Accumulators	442 ,,	494 ,,
Dry cells...	365 ,,	475 ,,
Cables and insulated wire	1,466 ,,	1,565 ,,
Bulbs	33 ,,	42 ,,
Total	4,017 tons	5,618 tons

The net value of imports in 1935 was 85¼ million Fmk. (£380,000), while in 1936 the turnover rose to nearly 111 million Fmk. (£490,000).

Co-operative Lamp Manufacture

The Co-operative Wholesale Society announces that it does not propose becoming member of the British Luma Co-operative Electric Lamp Society along with the Scottish and Swedish Wholesale Societies. It is not prepared to take a financial interest in the Society, but promises to do all it can to help the sales of the new co-operative undertaking.

Southampton Docks

The Southampton Docks Handbook for 1937 which has been issued by the Southern Railway, is a useful guide to the accommodation and equipment at Southampton. Particulars are also given of rates and charges, while there is a fund of general information. It is profusely illustrated and includes pictures of many of the more important liners which are docked at Southampton.

The Hotel Exhibition

The participation of the British Electrical Development Association, the Electric Lamp Manufacturers' Association, the General Electric Co., Ltd., and other leading electrical manufacturers, will ensure a strong electrical interest at the Hotel, Restaurant and Catering Exhibition, which is to be held at Olympia, London, from November 30th to December 8th.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price. March 23rd.	Fortnight's Inc. or Dec.
[a] Acid Oxalic ... ... per cwt.	50s.	—
[a] Ammoniac, Sal ... ... per ton	£36	—
[a] Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
[a] Borax ... ... ,,	£17	—
[a] Copper, Sulphate ... ... ,,	£15 10s.	—
[a] Potash, Chlorate ... ... per lb.	3¾d. to 4¾d.	—
[a] ,, Perchlorate ... ... ,,	6d.	—
[a] Shellac... ... ... per cwt.	£4 18s.	—
[a] Sulphur, Commercial ... ... per ton	£11	—
[a] ,, Roll ... ... ,,	£11	—
[a] Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
[a] ,, Crystals... ... ... per ton	£5 to £5 5s.	—
[a] Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
[b] Aluminium, Ingots ... ... per ton	£100 to £105	—
[b] ,, Wire ... ... per lb.	1/1 to 1/9	—
[b] ,, Sheet and Foil... ... ... ,,	1/3 to 2/9	—
[p] Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£272	£33 inc.
Grade II ... ... ,,	£189	£21 inc.
Grade III ... ... ,,	£100	£8 inc.
[c] Brass (rolled metal 2" to 12" basis) ... per lb.	10¾d.	¼d. dec.
[c] ,, Tubes (solid drawn) ... ... ,,	1/1½ to 1/2	
[c] ,, Wire, basis ... ... ,,	11¼d.	
[c] Copper Tubes (solid drawn) ... ... ,,	1/3¼	
[g] ,, Bars (best selected) ... ... per ton	£107	£1 inc.
[g] ,, Sheet ... ... ,,		
[g] ,, Rod ... ... ,,		
[d] ,, (Electrolytic) Bars ... ... ,,	£77	
[d] ,, ,, Wire Rods ... ... ,,	£74	
[d] ,, ,, H.C. Wire ... per lb.	11¼d.	
[f] Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/9	2 to 6½d. inc.
[f] ,, Sheet ⅛" thick & up ... ... ,,	1/7 to 1/10	2d. to 3d. inc.
[a] German Silver Wire, Nos. 1 to 12 ... ... ,,	2/6	4d. inc.
[h] Gutta-percha, fine ... ... ,,	nom.	—
[h] India-rubber, Para-fine ... ... ,,	11¼d.	¼d. inc.
[i] Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
[i] ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
[g] Lead, English Pig ... ... ,,	£34	£2. 10s. dec.
[g] Mercury ... ... per bot.	£14 7s. 6d.	2/6 inc.
[e] Mica (in original cases) small ... per lb.	10d. to 2/–	
[e] ,, ,, ,, medium ... ,,	6/– to 12/6	
[e] ,, ,, ,, large ... ,,	13/– to 17/6 up	
[p] Phosphor Bronze, plain castings ... ,,	1/3½	¼d. inc.
[p] ,, ,, drawn bars & rods ,,	1/4¼	¼d. inc.
[p] ,, ,, rolled strip & sheet ,,	1/2¼	¼d. inc.
[p] ,, ,, wire ... ... ,,	1/4¼	¼d. inc.
[o] Platinium ... ... per oz.	£11 15s.	—
[d] Silicium Bronze Wire ... ... per lb.	1/–	—
[g] Spelter... ... ... per ton	£33 2 6	£2 6 3 dec.
[r] Steel, Magnet, in bars ... ... per lb.	7¾d.	—
[g] Tin, Block (English) ... ... per ton	£297 10s.	£21 inc.
[n] ,, Wire, Nos. 1 to 16 ... ... per lb.	4/6	5d. inc.

Quotations supplied by :—

[a] G. Boor & Co.
[b] The British Aluminium Co., Ltd.
[c] Thos. Bolton & Sons, Ltd.
[d] Frederick Smith & Co.
[e] F. Wiggins & Sons.
[f] India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
[g] Henry Gardner & Co., Ltd.
[h] Edward Till & Co.
[i] Bolling & Lowe.
[n] P. Ormiston & Sons.
[o] Johnson Matthey & Co.
[p] C. Clifford & Sons, Ltd.
[r] W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes."

Orders Recently Booked

Marryat & Scott, Ltd., have in hand a contract for the dismantling and removal of two 30-cwt. direct acting hydraulic goods lifts at the works of Hudson & Kearns, Ltd., printers, and the installation of electric lifts. The water consumption involves an outlay of £140 per annum and it is claimed that the new lifts will show a saving of not less than £100 per annum. They will be fast automatic machines with automatic floor-finding devices and the patent "Leveltric" vernier drive, so that attendants can be entirely dispensed with.

Oil Engine Company's New Premises

New headquarters' offices, laid out in modern lines, have been opened by Blackstone & Co., Ltd., Stamford, who this year celebrate their centenary. The offices have a total floor space of nearly 14,000 sq. ft., and provide ample accommodation for a staff of over 150. The upper floor, which is divided by steel and glass partitions, consists of the main offices. The ground floor contains the boardroom and reception rooms, and the advertising, filing and mailing departments. The new offices have strong rooms for the storage of drawings and other important documents, and a new photostat machine has been installed for copying work. A teleprinter on the ground floor is in direct communication with Imperial House, Kingsway, the London office of the company, from which messages can be forwarded immediately to R. A. Lister & Co., Ltd., their associated company. The offices are electrically heated, the temperature being automatically regulated by thermostatic control.

Old Cromptonians

The annual dinner of the Association of "Old Cromptonians" will be held at Grosvenor House, Park Lane, on May 24th. Colonel R. E. Crompton will preside. The Committee of the Association states that it is particularly looking forward to welcoming overseas or other members who may be visiting London for the Coronation. Tickets are 12s. 6d. each, and any further information may be obtained from Crompton Parkinson, Ltd., Bush House, Aldwych, W.C.2.

Brass Pressings

The Copper Development Association has published another of its useful little books for the metal industry, and in this case "Brass Pressings" should be of interest to all engaged in the design or use of products cold-formed from strip and sheet metal. The book deals chiefly with some of the uses, together with the properties of brass and other copper alloy strip and sheet used for the manufacture of pressings, etc., and includes an outline of some of the more important metal working operations.

New Catalogues and Lists

A.E.G. Electric Co., Ltd., 131, Victoria Street, Westminster, S.W.1.—List No. V8 describing a new heater-fan and also a low-priced air-conditioning cabinet for home or office use.

Delco-Remy & Hyatt, Ltd., 111, Grosvenor Road, London, S.W.1.—A refrigerator motor manual for designers and manufacturers of refrigerators and air conditioning plant.

T. Bolton & Sons, Ltd., Mersey Copper Works, Widnes.—Photographic prints showing spot-welding electrode tips in cadmium copper and end-rings for electrical machines in h.c. copper.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—A pamphlet dealing with small Coronation lighting equipment for home use.

Gilbert Gilkes & Gordon, Ltd., Kendal.—A catalogue of "GGG" pumps.

H. E. Ashdown, Ltd., Eccleston, St. Helens, Lancs.—A catalogue of plastic mouldings.

Twentieth Century Electrical, 89, Newman Street, London, W.1.—An illustrated brochure dealing with lighting fittings.

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W.1.—Cambridge pH recorders are dealt with in folder 56.

Brittain's Electric Motor Co., Eastdown Works, Dermody Road, Lewisham, London, S.E.13.—An abridged price list of electric motors.

Bankruptcy Proceedings

C. E. Pittman, electrical contractor and wireless dealer, 49, Birchanger Road, South Norwood, S.E.25, and 12, Station Road, West Croydon.—Discharge suspended for nine months until November 17th, 1937.

J. W. Hackett, radio and electrical engineer, 11, Paxton Terrace, Barrow-in-Furness.—Trustee, Mr. W. G. Pearson, 16, Cornwallis Street, Barrow-in-Furness, Official Receiver, released March 9th.

A. W. Cowgill, radio and electrical engineer, 26, Water Street, and 49B, Vale Road, Rhyl.—Last day for receiving proofs for dividend April 2nd. Trustee, Mr. R. T. Smith, 3, Clwyd Street, Rhyl.

R. A. Robinson (Highbury Engineering Works), radio and electrical engineer, 287, Upper Street, Islington, N.1.—Last day for receiving proofs for dividend April 7th. Trustee, Mr. C. B. Park, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

H. A. Simpson and **E. Dyson** (Simpsons), radio and electrical engineers, 18, Eastbank Street, Southport.—Last day for receiving proofs for dividend April 3rd. Trustee, Mr. W. G. Lithgow, 413, Lord Street, Southport.

F. H. Villiers (Vacuum Cleaner and Electrical Appliance Co.), electrical engineer, 72, Park Hill, Clapham, S.W.4.—Last day for receiving proofs for dividend April 5th. Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C.1, Official Receiver.

A. G. Applegate, radio dealer, 47, Trinity Street, Frome.—First and final dividend of 4s. 3½d. in the £, payable March 24th, at 26, Baldwin Street, Bristol.

N. Hall (Hall & Co.), wholesale and retail radio dealer, 66, Margaret Street, and 278, Stamford Street, Ashton-under-Lyne.

—Receiving order made March 10th on debtor's own petition. Public examination April 26th at the Town Hall, Ashton-under-Lyne.

L. G. Bailey (L. G. Bailey & Co.), radio dealer, 1, Port Soderick Street, Salford.—Last day for receiving proofs for dividend March 31st. Trustee, Mr. W. H. Chesworth, 1, Cooper Street, Manchester.

C. V. Adnitt, radio dealer, 11, Alfred Street, Rugby.—First and final dividend of 5d. in the £, payable March 15th at 9-11, High Street, Coventry.

A. H. Lipman (H. Lipman & Co.), electrical and general factor, 49, Jubilee Street, E.1.—Application for discharge to be heard on April 16th at Bankruptcy Buildings, Carey Street, W.C.2.

C. Armstrong-Lamb, electrician, 8, Clarendon Place, Hyde.—Trustee, Mr. P. M. Milward, Byrom Street, Manchester, Official Receiver, released March 3rd.

P. T. King, electrical engineer, 8, Buxton Road, and 20, Gordon Street, Luton.—Trustee, Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver, released March 3rd.

F. J. Couchman, wireless and electrical engineer, 1, High Street, Sturry.—First and final dividend of 2s. 4d. in the £, payable March 24th at 1, The Parade, Canterbury.

J. G. Raad (Rardo Radio and Television Co.), wireless dealer, 62, Stamford New Road, Altrincham.—First and final dividend of 9d. in the £, payable March 19th at 47, Mosley Street, Manchester.

Company Liquidation

Fisher & Bowen, Ltd., 128-130 Linskell Street, and 118, Wallsend Road, North Shields, and at Front Street, Seahouses, Northumberland, wireless dealers, &c.—This company went into voluntary liquidation in December last when the statement of affairs showed liabilities of £1,312, with a deficiency of £1,193, so far as the creditors were concerned. The liquidator has issued a notice to the creditors intimating that the winding up of the company has been completed and a first and final dividend at the rate of 1s. 8d. in the £ has been declared.

Dissolutions of Partnership

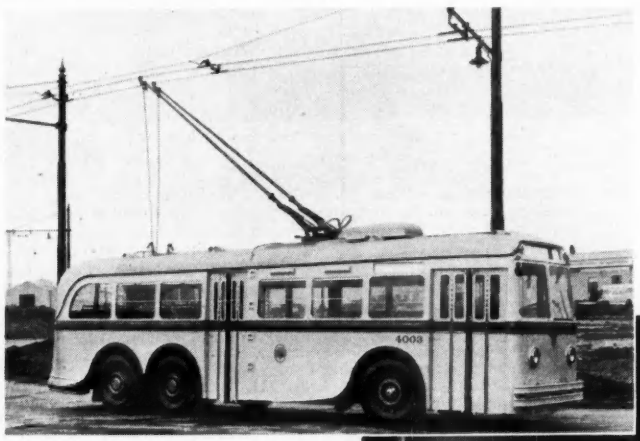
McAlister and Wilcock, radio engineers, 42, Rice Lane, Liverpool.—Messrs. T. Wilcock and W. McAlister have dissolved partnership. Mr. Wilcock will attend to debts and carry on the business.

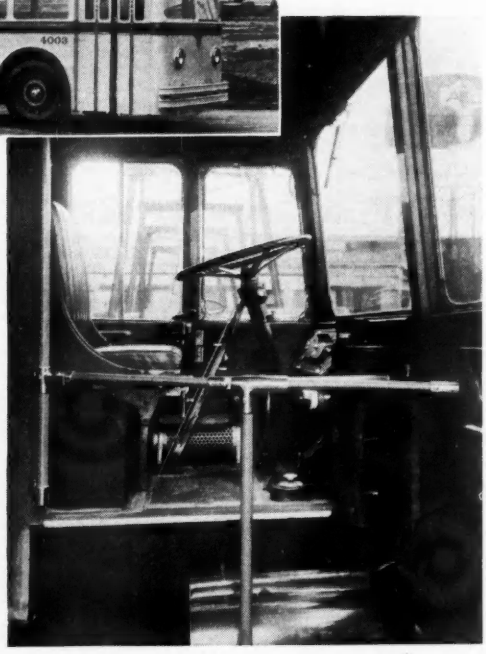
H. W. Scott, wireless engineers, 22, Mill Road, Cambridge.—Messrs. H. W. Scott and O. H. Dawes have dissolved partnership. Mr. Scott will attend to debts and carry on the business.

Woodford Electrical Co., electrical engineers, 238, Woolwich Road, Charlton, S.E.—Messrs. R. F. Liddle and G. R. Low have dissolved partnership. Mr. Liddle will attend to debts and carry on the business.

British Trolley-buses for Canada

SEVEN A.E.C.-English Electric, six-wheel, single-deck, 38-seater, trolley-buses ordered by the Montreal Tramways Co. have recently been completed. Particular interest attaches to these vehicles, because they are the first to be made by the A.E.C. with the contactor panel and resistances mounted at the rear of the chassis, a patented arrangement of the manufacturers. When commissioned they will bring the total number of A.E.C. vehicles operated by the Montreal Tramways Co., to sixty-seven.





One of the new A.E.C.-English Electric trolley-buses ordered by the Montreal Tramways Co. and (right) interior of the driver's cab

The power system comprises a single compound motor with a one hour rating of 80 h.p. driving through a short propeller shaft. The compressed air equipment has several noteworthy points. Two independent reservoirs fitted with non-return valves are used, one for the brakes and one for the door operation. The compressor unit of 5 cu. ft. capacity is of the two cylinder reciprocating type of unit construction with a 500-V motor, and attachment to the chassis is by silent bloc bushes, ensuring secondary insulation and the elimination of vibration. Air is drawn through a filter fitted on one of the tubular cross-members which acts as a silencer. The layout of the equipment with the air reservoir check-valve and silencer mounted as a single unit reduces piping and facilitates maintenance.

Front air brake cylinders are mounted directly over hollow king pins through which the piston rods operate directly on to the front camshaft levers, and thus application of brakes cannot affect steering or vice versa. Both regenerative and rheostatic braking are obtainable on these chassis; the latter is also effected on the first movement of the air brake pedal by means of a brake switch in the master controller.

The direct driven low voltage generator is mounted at the front end of the motor. Separate yokes are provided for the main motor and generator, and the generator armature is built on a separate spider mounted on the extension of the motor shaft. The frame is bolted to the main motor end shield and the generator can be dismantled without disturbing the main motor. This 30-V generator has a cut-in speed of approximately 3.5 m.p.h. Full load output of 1,600 W is obtained at a road speed of approximately 5 m.p.h.

Protective devices include positive and negative circuit-breakers, set to trip at predetermined over loads, a lighting arrestor and radio choke coils (functioning in connection with the lighting arrestor) connected on the line side of the apparatus. Apart from the master controller all electrical contactor equipment, resistances, &c., are mounted as a complete unit at the rear of the frame, access being provided through doors in the rear panelling. The whole unit is easily detachable, being arranged to slide rearwards out of the frame. All that is necessary for this operation is to uncouple the bolts at the ends of the two cross-members on which the sub-frame supporting the unit is carried and to disconnect the control and two power wires, these being arranged on the face of the contactor panel, and to withdraw them through the cable gland.

Above the resistances is an aluminium-asbestos heat partition and longitudinal side shields prevent snow and mud, etc., thrown up by wheels from reaching the unit, but allow the free flow of air for cooling the resistances. A bumper bar built into the body protects the unit.

These trolley-buses have a wheel base of 16 ft. 2 in., an overall length of 32 ft., and an overall width of 8 ft. 3 in. The rear axle centres are extended to 4 ft. 4in., for the fitting of snow chains. Designed to accommodate thirty-five standing passengers additional to the thirty-eight for whom seats have been provided, the bodies are of the all-metal type constructed by Metropolitan-Cammell-Weymann Motor Bodies, Ltd.

Entrance and exit doors are placed on the right hand side; both are fitted with double jack-knife, pneumatically operated doors controlled by the driver.

In the case of the exit there are pneumatic treadle mats covering the steps so that the doors, when released by the driver, may be automatically opened by passengers standing on the steps. The severe Canadian winter has dictated the fitting of a special heating system comprising fifteen B.T.H. 500-W heaters in the passenger saloon and 2,600-W heaters in the driver's cab. For the retention of interior warmth the spaces between the roof and side panels are filled with aluminium foil. An interesting feature is the fitting of a new type trolley mounting which, by reducing projections to a minimum, considerably enhances the appearance of the vehicles.

Electricity Supply

Lighting, Domestic, Power

Addington.—MAINS EXTENSIONS.—The County of London Electric Supply Co. is to extend mains at a cost of £652 to supply twenty-six houses in Devonshire Way.

Amble (Northumberland).—CHEAPER ELECTRICITY.—A reduction in the lighting flat rate from 4½d. to 4d. per kWh, as from April 1st, has been decided upon by the Urban District Council.

Bexhill.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains and sub-stations at a cost of £8,336.

CONSUMERS' APPARATUS.—A sum of £1,000 from the net surplus is to be utilised for the purchase of consumers' electrical apparatus.

Biggar (Lanarkshire).—ALL-ELECTRIC HOUSES.—The Town Council has agreed that the third section of the North Crofts housing estate to be developed shall be all-electric, and it is to provide an electric cooker and a washing boiler for each house. The supply authority is the Clyde Valley Electrical Power Co.

Colwyn Bay.—CHANGE-OVER.—The Lighting Committee has decided to change over the method of supply to a.c. in all parts of the borough at present using d.c. at a total cost of £11,737.

Coventry.—SWITCHGEAR.—Sanction to borrow £9,138 for switchgear is being sought by the Electricity Committee.

Croydon.—MAINS EXTENSIONS.—In order to provide additional supplies to Trojan, Ltd., Purley Way, and Powers Accounting Machines, Ltd., Aurelia Road, the Electricity Committee is to extend its mains at a cost of £1,122.

Darlington.—STREET LIGHTING.—The borough electrical engineer is preparing a scheme for lighting the various main roads in the town by electricity.

Dartford.—CABLE-LAYING.—The Electricity Committee is to lay a.c. cables along Dartford Road at a cost of £2,289.

Finchley.—"FREE" COOKERS.—At April 1st, 1936, approximately 100 cookers were connected to the mains, all of which were owned by the individual consumers as the Council had no assisted wiring, hire or hire-purchase schemes. In view of the fact that almost every house in Finchley contains a gas cooker, something of a rather unusual nature had to be attempted in order to popularise electric cooking. This has been done by offering all consumers on the two-part tariff a "free" electric cooker. In order to do this it was necessary that the Council should have its two-part tariff authorised under Section 42 of the 1926 Electricity (Supply) Act. This Section provides that where a two-part tariff is authorised by the Minister of Transport the fixed charge may contain a sum in respect of the rental of cookers. It is maintained that up to the present no two-part tariff in operation in the country is an authorised tariff under the 1926 Act. It is expected that the psychological appeal of a "free" cooker will result in an unusual rate of development. The two-part tariff adopted by the Council in 1936 has not been increased so that, in effect, all the consumers who are at present taking supplies on this tariff receive an electric cooker, two aluminium saucepans and one kettle without further charge.

Gateshead.—CABLE LAYING.—The North-Eastern Electric Supply Co., Ltd., has intimated its intention of laying cables on the Church Army housing estate, Kyle Road, St. James Road, and a cross back street near Beechwood Gardens and Lobley Hill Road.

Glasgow.—REPLACING CONVERTORS.—The Transport Committee has approved the replacement of four of the existing 500-kW rotary convertors at Kinning Park sub-station by three 1,500-kW units at an estimated cost of £10,000.

CONSTRUCTIONAL WORK AT DALMARNOCK.—With regard to the reconstruction of the main 20,000-V switchboard at Dalmarnock generating station, the Electricity Committee has agreed that this work shall be proceeded with at an estimated cost of £150,000. It has also been decided to erect and equip an additional 20,000-V feeding point at Aikenhead Road and to install 20,000- and 6,500-V switchgear and 20,000/6,500-V transformers in various sub-stations in order to cope with the anticipated maximum demand next winter. The estimated cost is £31,200.

Great Yarmouth.—LOANS.—Sanction has been received from the Electricity Commissioners to a loan of £18,477 for works in connection with the modification and extension of switchgear and the re-winding of a transformer. The Minister of Health has consented to a loan of £5,239 for public lighting.

Ilminster.—ELECTRIC STREET LIGHTING.—The Urban District Council has adopted a recommendation by the Lighting Committee that the town shall be lighted by electricity.

Liverpool.—RATE AID.—A contribution of £70,000 in aid of the rates (equivalent to a rate of nearly 3d. in the £) is to be made by the Electricity Department for the fifth year in succession.

London.—STEPNEY.—In the 1935-1936 abstract of accounts of the electricity undertaking sent to us by Mr. A. E. Campbell, borough electrical engineer and manager, the total cost of production and purchases from the C.E.B. is given as £204,561, which represents 0.541d. per kWh sold against 0.583d. in the previous year, a reduction of 7½ per cent. Gross revenue was £504,561 (against £479,216) and working expenses £226,764 (£206,212), the net surplus after meeting interest charges being £48,999 (£52,155). There was a transfer of £26,200 to the general rate fund. Sales, excluding supplies to the C.E.B., totalled 90,732,081 kWh, of which 15,960,833 kWh was supplied to the Bethnal Green Borough Council, consumption in the Stepney area increasing by 6,360,436 kWh (the largest in the history of the undertaking) or 9.3 per cent. Connections in kW at March 31st, 1936, were as follows:—Private lighting, 25,562; power and heating, 69,492; public lighting, 769; private bulk supplies, 16,485; total, 112,308. Connections to the mains numbered 38,891, the average number of applications for new supplies, extensions, transfers, &c., dealt with daily being 32, apart from 13 in Bethnal Green, the operative and administrative work of the undertaking in that borough being under the control of the Stepney engineer. Since July, 1935, when the public lighting in Stepney was taken over by the Electricity Supply Committee, 280 new lanterns have been erected. These are suitable for electric-discharge lighting when a.c. is available.

DEPTFORD.—When the Borough Council last week approved the proposal to adopt electric street lighting in place of the existing gas lighting, as briefly reported in our last issue, it was stated that the scheme of conversion would take about two and a half years and would involve 50 miles of streets. Councillor F. J. Morris, chairman of the Highways Committee, said this was a definite step forward. It had been obvious that the lighting of the side streets could be very much improved. The recommendation to accept the tender of the London Electric Supply Corporation, Ltd., was accepted without further comment.

HACKNEY.—It is proposed to provide a transformer centre in the Nisbet Street area. The cost of the buildings, switchgear, transformer and e.h.v. mains is estimated at £3,250.

Middlesbrough.—PROPOSED DEVELOPMENTS.—During the five years 1937-42 the Town Council proposes to spend the following sums on its electricity undertaking:—Mains, £88,000; switchgear and transformers, £10,800; services, £30,000; meters, £22,000; showrooms, £15,000.

EXTENSION.—The Town Council is to spend £2,560 on the electricity supply to new offices being built in Borough Road for the *North-Eastern Daily Gazette*.

Newcastle-on-Tyne.—ACQUISITION OF UNDERTAKING.—The City Council has decided to continue negotiations with the Newcastle and District Electric Lighting Co., Ltd., on the basis of acquiring the company's sub-station and distribution system in the city area. The City Council's option to purchase, within the city boundary, the undertaking of the North-Eastern Electric Supply Co., Ltd., matures this year and expert advice is being sought on the question. It is estimated unofficially that the cost of acquisition would be £2,500,000.

Portland.—COMMERCIAL COOKING TARIFF.—Having received an inquiry regarding the use of electricity for fish frying, the electrical engineer has suggested that the Electricity Committee should adopt a tariff of ¾d. for this purpose and for commercial cooking generally.

Rawtenstall.—CHEAPER ELECTRICITY.—Reductions in electricity charges amounting to £1,260 have been approved by the Council. They come into force on April 1st.

Russia.—WIND POWER STATION IN THE CRIMEA.—A wind power station of 10,000 kW is being built at the top of Mount Aï Petri, in the Crimea, about 4,000 ft. above sea level, learns *Reuter's Trade Service* from Moscow. The laying of the foundations has begun for a tower about 500 ft. high, to which two wind power sets of 5,000 kW each will be fixed.

Electric Boiler Tests in Austria

In a recent issue of *E.T.Z.* Herr Weinrath gives some details of the results obtained with an electrically heated boiler used for producing steam for a central heating installation in Austria. The boiler is heated by means of 1,000-kW single-phase electrodes, 16.66 cycle and generates steam at a pressure of 0.2 atmosphere. During the first few weeks of operation undue wear of the electrodes was experienced and also, at the time of switching power on to the electrodes, there were excess voltages up to three times the normal. The electrodes had been designed to heat water having a resistance of from 1,200 to 1,500 ohms per cubic centimetre. They were originally cylindrical, a form which was found to be unsuitable for the proper circulation of the water and for the production of steam, the shape being also the cause of the undue electrode wear. Experiments showed a spheroidal shape to be the best. With the new electrodes it became necessary to reduce the water resistance by the addition of a little soda. In tests with a model boiler using the same water as in the main steam generator it was found that the gases given off at the electrodes contained from 60 to 80 per cent. of inert gases, from 20 to 30 per cent. of hydrogen, and traces of oxygen, the gases (even in the presence of air) being non-explosive.

The tower will turn on a hinged base. According to Russian papers the Ai Petri station will be the most powerful wind station in the world, its estimated output being 25,000,000 kWh a year. The biggest stations of this sort now existing in the Soviet Union are at Kara-Bogaz-Gola, in Turkmenia, and Balaklava, in the Crimea, but they are only of 100 kW each.

Samlesbury.—OVERHEAD LINES.—The Lancashire Electric Power Co. has received sanction to the erection of overhead lines at Samlesbury. This follows an inquiry into the company's application held by the Minister of Transport.

Stockton-on-Tees.—MAINS AND EQUIPMENT.—The Town Council is to apply to the Electricity Commissioners for sanction to borrow £1,580 for equipment and mains in connection with the Bishopton Road sub-station.

LOAN.—Sanction has been received by the Town Council to borrow £5,000 for mains and services and £750 for cable.

Wessex.—CHEAPER LIGHTING.—The Wessex Electricity Co. is reducing the lighting flat rate in its area of supply from 8d. to 7d. per kWh.

West Hartlepool.—NEW TARIFF.—A new tariff for the small power user (between 50,000 and 200,000 kWh per annum) has been introduced by the Town Council. The charge is £5 for each kW of maximum demand plus ¼d. per kWh for all energy consumed.

NEW FEEDER.—An additional feeder cable is to be laid by the Town Council from a point near Lowther Road and Hart Road to Walter Street at a cost of £650.

SUB-STATION.—The Town Council is considering erecting a sub-station in Tower Street, at a cost of £400.

Walsall.—CONCESSIONS.—Last week the Council authorised reductions in electricity charges to come into force as from the June quarter, the concessions amounting to £13,500.

Traction

Argentina.—BRITISH RAILCARS.—Several Diesel-electric railcars have been ordered from the Birmingham Railway Carriage and Wagon Co. and the first one is now being shipped. It is constructed of aluminium alloy, which reduces the weight to less than half that of an ordinary railway carriage. Capable of travelling at 65 m.p.h., it uses a gallon of fuel oil in eight miles. It has an electric kitchen.

Hampshire.—PORTSMOUTH ELECTRIFICATION.—The electrification of the Southern Railway line is now complete to Fratton, a district of Portsmouth, and four-car trial trains are being operated between there and Waterloo.

London.—AUTOMATIC LIFTS.—Automatic passenger lifts have been installed at Goodge Street Station. Each is capable of raising a load of 3,750 lb. at speeds of from 450 to 600 ft. per min., the vertical rise being 85 ft. The driving and controlling equipment is situated immediately above the lift well-hole. A motor, operated from the Board's d.c. 630-V traction supply, drives a 200-V d.c. generator, which is directly and permanently connected by conductors to the armature of the lift hoisting motor, and the exciter, which gives approximately the same voltage, energises the field magnets and certain of the control circuits. The motor generator can be started and stopped either by a hand starting panel or by push-buttons (operating a relay on the 50/55-V d.c. rectified supply) on landings. The main hoisting machine is of the gearless direct-drive type. The brake is spring applied and electrically released by a magnet mounted directly above it. The lift action is determined by the pressure and direction of the current supplied to the hoisting motor by the generator. Auxiliary control at 50-55-V d.c., obtained from a metal rectifier, replaces the functions of the manual operator when the lift is required to work automatically. For all three lifts speech equipment comprising a sound film carried on a continuously rotating electric drum with a light-sensitive cell and amplifier give audible warning through loudspeakers on the landings and in the car when the doors are about to close. The lifts are made to space themselves correctly by arranging that the stepping switches of the individual banks which are normally driven by impulses received from a switch carried on the speech equipment drum are corrected once in each landing cycle by having to wait for a feed from the master set, which is stepped round at a constant speed so long as one or more lifts remain on automatic operation.

TROLLEY-BUS PLANS.—Continuing its consideration of the London Passenger Transport Bill last week and this week, the Select Committee of the House of Commons rejected a proposal to run trolley-buses along the south side of Bloomsbury Square, through Hart Street and returning by way of New Oxford Street and Bury Street. Approval, however, was given to plans for turning in the vicinity of Victoria Station (along Wilton Road and into Victoria Street) in place of the present Vauxhall Bridge Road terminus in the case of the tramway. A scheme for a through trolley-bus route at London Bridge by way of Tooley Street, Duke Street and Borough High Street to Southwark Street was rejected.

TRAFFIC SIGNALS IN PICCADILLY CIRCUS.—It is expected that the system of thirty vehicle-actuated traffic signals being installed in Piccadilly Circus and the vicinity will be in operation in time for the Coronation. The cost will be approximately £5,600.

Merseyside.—NEW EQUIPMENT.—The Mersey Railway, Britain's first electrified steam railway, is to install two 750-kW rectifier sets in its sub-station at Birkenhead in order to cope with the increased electric train service to be introduced when the L.M.S.R. Wirral lines are changed over to electrical operation.

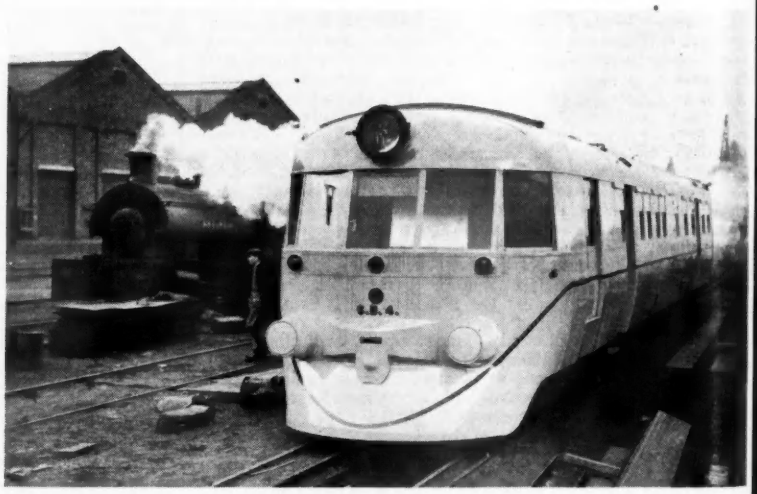
Russia.—MOSCOW "METRO" EXTENSION.—The short extension of the Moscow "Metro" from Smolenskaia Rinok to the Kiev main-line station was opened early this month. Serious trouble in keeping the tubes of the route opened in 1935 water-tight has led to the evolution of a new material known as "hydro-isol" with which the tunnels are to be lined.

EXPRESS LOCOMOTIVES.—After service experience over two years the Soviet railway authorities are extending the use of their express electric locomotives, and large numbers of these are now being built at Kolomna. They have three twin-armature, quill-drive motors aggregating 2,720 h.p. on the one-hour rating and with a maximum tractive effort of 37,000 lb. The top speed is 80 m.p.h. and the total weight 120 tons.

ELECTRIFIED MILEAGE.—With the recent opening of the new Bielovo-Kusnetzk line in Siberia the length of electrified railways actually in operation in the U.S.S.R. has been raised to just over 700 route-miles.

Scotland.—SUGGESTED EXTENSION OF GLASGOW "UNDERGROUND."—The general manager of the Transport Department is to report on the practicability and cost of extending the city's underground railway, giving an idea of the proposed route.

South Shields.—TROLLEY-BUSES.—The Transport Committee has decided upon the conversion of the tramways from King Street to Chichester to trolley-vehicle operation at a cost of £17,500.



The new Diesel-electric railcar

United States.—MORE TROLLEY-BUSES.—During 1936 approximately 550 new trolley-buses were put into service, this number being almost equal to the aggregate for the preceding ten years. The total number of new tramcars placed in service during 1936 was 300.

Communications

China.—LONG-DISTANCE TELEPHONY.—A long-distance telephone service is about to be inaugurated between Shanghai and the three cities of Loyang, Kaifeng, and Lincheng in the Province of Honan.

France.—EIFFEL TOWER TELEVISION STATION.—What is claimed to be the world's most powerful commercial television broadcasting station will be one of the attractions of the Paris Exhibition, states *Reuter* (Paris). The apparatus, which is rated at 30 kW, has been purchased by the French Ministry of Posts, Telegraphs and Telephones and is to be installed at once as a permanent transmitter in the Eiffel Tower.

Germany.—BROADCASTING CONFERENCE.—The International Broadcasting Union has just terminated its winter meeting in Berlin. Delegates or observers numbered 94 and represented 23 European countries, as well as the United States, the Dutch East Indies and Porto Rico. Four new member organisations were admitted, namely, the Bulgarian State Broadcasting Service, the Canadian Broadcasting Corporation, Indian Broadcasting Service ("All-India Radio") and the National Association of Broadcasters of the U.S.A. The Technical Commission examined the European wavelength situation

in detail and proposed a fresh effort to clear certain interferences which still exist. The Council proposed the working out of a plan for the systematic allocation of short waves on a world scale, to be elaborated at the Telecommunications Conference of Cairo in 1938. New recommendations concerning the characteristics of music lines were worked out jointly with some of the representatives of telephone authorities. The Legal Commission had a heavy agenda list. It concluded that transmission of images to the public by means of television was simply the complement of the transmission of sound. In other words, television is only a form of "radio-diffusion" or broadcasting, and as such falls directly within the sphere of activity of the broadcasting organisations. During their visit to the Ministry of Posts and Telegraphs delegates were shown a television programme which included recordings of various incidents at a meeting in which they themselves figured, and they also "looked in" at a telephone conversation between Berlin and Leipzig during which the correspondents saw each other by television. Further, in the laboratories of the Reichs Rundfunk G.m.b.H. there was a demonstration of transmission over a new music circuit, 1,650 kilometres long, on which no appreciable musical distortion could be detected. The transmitter section of the German radio industry's organisation also made a special display of measuring instruments and recording systems. The short-wave Zeesen station and the medium-wave transmitter at Tegel were also visited.

BROADCASTING.—A reorganisation of Germany's broadcasting institution has been announced by the Propaganda Ministry, whose chief is Dr. Goebbels, states *Reuter* from Berlin. Under the new scheme the administration will be decentralised, thus providing for more independent working of the various transmitting stations. A new post of Director-General for the supervision of all transmitting stations has been created, to which Dr. Heinrich Glasmeier, manager of the Cologne broadcasting station, has been appointed.

Great Britain.—B.B.C. FINANCES.—The report of the British Broadcasting Corporation for 1936 reveals that the total income was £2,953,469, an increase of £480,897. Revenue expenditure was £2,579,597, and a balance of £373,872 was carried to the revenue appropriation account, which now stands at £404,789.

OVERHEAD TELEGRAPH WIRES.—In the House of Commons on March 22nd Mr. Holdsworth asked the Postmaster-General whether he was aware that severe snowstorms and high winds invariably caused serious telegraphic delay, particularly to news services; whether, to avoid that state of affairs, telegraph lines of all classes in all exposed parts were to be put underground; and whether he was prepared to take the necessary action for this improvement to be carried out forthwith. Major Tryon said that he was aware that interruption of telegraph lines sometimes occurred owing to stormy weather. Approximately 80 per cent. of the total telegraph wire mileage owned by the Post Office was now underground, including circuits on all the main trunk routes, and although additional lines were placed underground whenever circumstances warranted, he regretted that financial considerations prohibited the immediate placing of all lines underground in exposed places.

Japan.—WIRELESS MERGER.—A *Reuter* message from Tokio states that a plan is under way to bring about amalgamation of the Japan Wireless Telegraph Co., Ltd., and the Japan International Telephone Co., Ltd. For this purpose the Hayashi Cabinet has decided to introduce amendments to the existing Japan Wireless Telephone Company Act in the present Session of the Diet. The Japan Wireless Telegraph Co., Ltd., was established in 1925 following the decision of the Japanese Government to monopolise the international radio-telegraphic service. The International Telephone Co. (of Japan), Ltd., was established in 1932 to control the international radio-telephone service. The Japanese Government now wishes to amalgamate these two companies for the sake of unified control of Japan's international communications. The consolidated company is to be permitted to lay submarine cables when necessary. With the proposed expansion also of radio equipment, radio connections will be inaugurated with over twenty additional countries, including Australia, Hong Kong and Egypt, while the radio telephone service is to be extended to thirteen new places, including British India, Siam and Argentina. Furthermore, a radio-telephoto service is to be regularly operated with Europe and China.

Hot-plate Comparisons

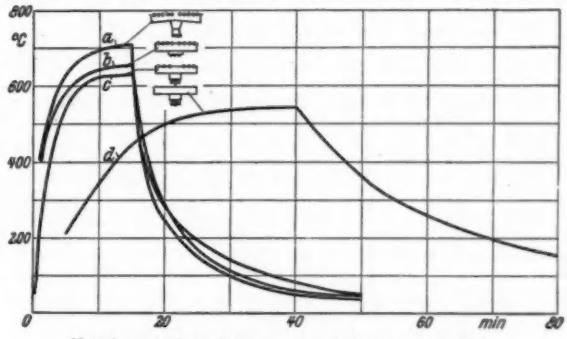
AN enclosed hot-plate may be regarded as the heating element of a self-contained heating utensil separated mechanically in order that it may be used with other utensils. The utensil and hot-plate are mechanically separate but must be as nearly as possible thermally continuous, dependance being placed upon conduction for the transference of heat. This requires close contact between the surface of the hot-plate and the bottom of the utensil, and involves the use of a relatively heavy hot-plate, of correspondingly high thermal capacity, with specially machined utensils. Improvements in materials and construction have made possible radiant hot-plates with heating elements operating at red heat and transferring heat by radiation and convection as well as by conduction. In this type the reduction of thermal capacity is specially desirable owing to the higher working temperature.

Test data comparing the characteristics of enclosed and radiant hot-plates are given by Professor H. Voigt in *Zeitschrift der Verband deutsche Ingenieure* (Vol. 80, p. 1,479). The two main types of radiant plates considered are: (1) The "Calrod" plate, developed by the American General Electric Co., with the heating element embedded in magnesium oxide in a spiral tube. The "Istra" plate made by the A.E.G., Berlin, is of similar construction. (2) The "Pyrox" plate, developed by the Westinghouse Electric Co., with tubular heating elements pressed between indented cover plates. The "Prometheus" plate made by Voigt and Haeffner A.-G., Frankfort-on-Main, is of this type. The accompanying illustration shows heating and cooling curves for plates (without utensils) as follows:—

Type.	Diameter. Ins.	Watts.	Thermal capacity. Wh.
(*a*) Calrod	8⅛	1,800	100
(*b*) Pyrox	7⅞	1,200	67
(*c*) Prometheus	7⅞	1,200	76
(*d*) Enclosed	8⅛	1,800	173

These data show clearly the higher thermal capacity, and resultant slower heating and cooling, of the enclosed plate, in which the heating element is embedded in grooves on the under side of the cast iron top. The values of heat storage given relate to operation without utensil and are therefore the most unfavourable possible. The actual thermal storage is a function of the mean temperature of the plate, which depends on the radiation characteristics of the bottom of the utensil. Aluminium is least favourable in this respect; the same plate stores less heat when using a steel or cast-iron utensil.

The higher temperature of radiant hot-plates does not result in higher temperatures inside the utensil. Measurements at 45 points distributed uniformly over the inside of the bottom of a utensil gave an average value of 107.2 deg. C. in the case of a ground aluminium saucepan, containing boiling water, on an enclosed hot-plate; and 105.6 deg. C. for the same



Heating and cooling curves (without utensils)

utensil on a radiant hot-plate, the thickness of the bottom of the utensil being 8 mm. (⅝ in.).

The Wh consumption and corresponding thermal efficiency of a 180 mm. (7⅜ in.), 1,200-W "Prometheus" radiant hot-plate, heating water from 20 to 95 deg. C. in an ordinary aluminium utensil of 7⅛ in. diameter, are approximately as follows:—

Quantity of water. Pints.	Wh consumption.	Efficiency. Per cent.
2	200	49
4	315	63
6	425	70
8	535	74

These values of efficiency are about 10 per cent. higher than the minima prescribed by the specification of the German Economic Group Electricity Supply. Statistics concerning the average daily consumption per capita give practically the same results for enclosed and radiant hot-plates. The outstanding advantage of the radiant type, that it does not require the use of special flat-bottom utensils and is not seriously affected by such deformation of the utensil bottom as is likely to occur in ordinary service. Inward bulging of the bottom causes a smaller increase in specific consumption than an equal outward bulge, but in neither case is the increase serious. The satisfactory performance of 180 mm. (7⅜ in.) radiant hot-plates in boiling small quantities renders the 145 mm. (5⅝ in.) size unnecessary in cookers.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Australia.—MELBOURNE.—April 27th. State Electricity Commission of Victoria. Transformers. (T.Y. 31219.)*

Aylesbury.—April 5th. Electricity Department. Duplicate bus-bar switchgear. (March 19th.)

Bath.—April 7th. City Council. Electrical supplies for one year. (See this issue.)

Birmingham.—April 5th. Electric Supply Committee. Transformers and switchgear. (March 19th.)

April 9th. Compressed air pipework with valves, fittings, &c., to extend the existing compressed air system at the Hams Hall power station. F. Forrest, chief engineer and manager, 14, Dale End (deposit £2).

April 26th. General Purposes Committee. Hot water apparatus, hot water services, air conditioning and ventilation plant and electrical services in connection with alterations and extensions at the Victoria Courts. Particulars from F. H. C. Wiltshire, town clerk, Council House (deposit £5 5s.), by April 1st.

Bridlington.—April 8th. Town Council. Electrical materials for one year. (See this issue.)

Bromsgrove.—Bromsgrove, Droitwich and Redditch Hospital Committee. Electrical and heating works in connection with the extension of the Hill Top Isolation Hospital. Particulars from F. Holyoake, clerk (deposit £1 1s.), by March 27th.

Carlisle.—April 6th. Corporation. Stoneware conduits and cable covers for one year. (March 19th.)

Cleethorpes.—April 5th. Borough Council. Cable, switchgear and main stores. (March 19th.)

Dundee.—April 6th. Electricity Department. Meters, domestic appliances, control units for electric cookers and double-pole, iron-clad switches for one year. (March 19th.)

Ealing.—April 1st. Corporation. Electric-discharge lamps for street lighting. (See this issue.)

Egypt.—CAIRO.—April 20th. Mechanical and Electrical Department, Ministry of Public Works. Two electrically driven pumping units, with auxiliary machinery at Drain No. 7 pumping station, Northern Part of Gharbia Province. Chief inspecting engineer, 41, Tothill Street, London, S.W.1 (deposit £2 1s.).

May 18th. Pumping stations extensions at Drains No. 1 and No. 11, and modifications of Seru and Faraskour outdoor transformer stations and increasing the number of insulator units for Faraskour transmission line. Each of the stations includes two electrically driven pumping units with auxiliary machinery, &c. Chief inspecting engineer (deposit £2 1s.).

Erith.—March 29th. U.D.C. Electricity Department. Cooker control units. (March 19th.)

Fleetwood.—Borough Council. Cables for one year; also four transformers, two 6,600-V cubicles and two l.v. distribution boards. (See this issue.)

Folkestone.—April 10th. Corporation. Internal and external wiring of 453 houses and flats on the Canterbury Road housing estate. (March 19th.)

Guildford.—April 5th. Electricity Department. H.v. and l.v. cables for one year. (See this issue.)

Heston and Isleworth.—April 7th. Electricity Department. Cables and two 600-kVA transformers. (See this issue.)

Lancaster.—April 2nd. County Mental Hospital. Electric lighting, heating and hot water services. A. Sewart, clerk to the Committee of Visitors, the Hospital.

Leyton.—April 5th. Corporation. One 500-kVA transformer and e.h.v. switchgear. (March 19th.)

Louth.—April 5th. Electricity Department. Cables, transformers and switchgear. (March 19th.)

Lowestoft.—April 9th. Electricity Department. Cables. (See this issue.)

Manchester.—April 5th. Electricity Committee. Neutral earthing resistances, switchgear and four 2,000-kVA static transformers; also static transformers for one year. (March 19th.)

April 13th. Transport Committee. Fifteen 6-wheel chassis, complete with all electrical equipment, including trolley gear and power wiring, suitable for double-deck, top-covered-type sixty-eight-seater trolley-buses; fifteen metal bodies. Eighteen 4-wheel chassis, with electrical equipment, &c., suitable for double-deck, top-covered-type fifty-six-seater trolley-buses; also eighteen metal bodies. General manager, Corporation Transport Department, 55, Piccadilly.

Marple.—April 6th. U.D.C. Cables, switchgear and transformers. J. K. Law, manager, Council Offices.

Middlesbrough.—April 19th. Electricity Department. 250-kVA transformers and 11,000-V circuit-breakers for one year. (See this issue.)

Middlesex.—April 19th. County Council. Electrical installations in the Middlesex Colony, Shenley. (March 12th.)

New Zealand.—WELLINGTON.—April 29th. Post and Telegraph Department. Secondary cells. (T.Y. 31220.)*

May 4th. Public Works Department. Insulators. (T.Y. 31232.)*

May 11th. Two switch and metering cubicles. (T.Y. 31233.)*

June 1st. Two electrically driven centrifugal pumps, with necessary electrical equipment, switchboard and control apparatus. (T.Y. 2413.)*

June 15th. Transformers. (T.Y. 31234.)*

Norfolk.—April 5th. County Council. Engineering works in connection with the East Dereham Central Isolation Hospital. (See this issue.)

Northern Ireland.—BELFAST.—April 19th. Harbour Commission. Two double jib and one single jib 1-ton electric cranes. Harbour engineer, Harbour Office.

Perth.—March 29th. Corporation. Switchgear, transformers and distribution panels for two sub-stations. (March 12th.)

Peterborough.—April 9th. County Council. Electrical work at the new casual wards at the Peterborough Public Assistance Institution. Particulars from W. J. Deacon, clerk of the County Council, County Council Offices, Bridge Street (deposit £2 2s.), by March 30th.

Portsmouth.—April 20th. Electricity Undertaking. Twelve months' supply of switchgear. (See this issue.)

Illuminated Coronation display. (See this issue.)

Prestatyn.—April 7th. U.D.C. Electricity Department. Twelve months' supply of electrical stores. (See this issue.)

St. Monance (FIFE).—Town Council. Electrical work in fifty-eight houses. L. A. Rolland, architect and surveyor, 47, High Street, Leven.

Shipley.—March 31st. U.D.C. One 750-kW mercury arc rectifier, complete with transformer and d.c. control panel. (March 19th.)

Shrewsbury.—Shropshire Education Committee. Electrical installation at Shrewsbury Technical College. (March 19th.)

Smethwick.—April 20th. Education Committee. Electrical installation at the new Smethwick Hall Senior Boys' and Girls' schools. (March 12th.)

South Africa.—PORT ELIZABETH.—April 8th. Municipality. Transformers, fuse and switchgear units, and cable. (T.Y. 31225.)*

PAARL.—April 21st. Municipality. Two centrifugal pumps with motors, switchgear, &c. (T.Y. 2411.)*

PRETORIA.—April 9th. Public Works Department. Cable. (T.Y. 31231)*

Southampton.—March 30th. Electricity Department. Fire extinguishing installation at the generating station, Western Esplanade. (March 12th.)

Sutton Coldfield.—April 12th. Electricity Department. E.h.v. switchgear, transformers and kiosks. (March 12th.)

Swansea.—April 5th. Electricity Department. D.c. high-pressure testing and fault-locating set. (March 19th.)

Swindon.—April 15th. Electricity Department. One year's supply of p.i. cables. (March 19th.)

Swinton and Pendlebury.—Borough Council. Electric lighting installation at the proposed alterations and additions to the Public Baths, Swinton. J. Knight, architect, 5, Cross Street, Manchester, 2.

Wallasey.—April 13th. Borough Council. Switchgear. (March 19th.)

West Ham.—April 5th. Borough Council. Electrical installation at the open-air swimming pool, Canning Town recreation ground. (March 19th.)

West Riding.—April 5th. County Council. L.p. hot water apparatus and electric lighting at Hemsworth Kinsley Council school extension. Education officer, County Hall, Wakefield.

Weymouth and Melcombe Regis.—March 30th. Electricity Department. Cable for one year. (March 12th.)

Whitworth.—April 12th. U.D.C. Transformer and metering set, cables, joint boxes, cut-outs and compound. (See this issue.)

Witney.—March 30th. R.D.C. Automatic electrically operated pumping unit (28,000 g.p.m.), and alterations and additions to existing plant at the Burford pumping station. Howard Humphreys & Sons, 17, Victoria Street, London, S.W.1 (deposit £2 2s.).

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberdeen.—Corporation. Accepted. Electrical work at 150 houses at Middlefield (£842).—Stroud & Weir.

Bexhill.—Electricity Committee. Accepted. H.v. cables (£849).—Telegraph Construction & Maintenance Co.

Recommended. Supplies for twelve months: Cables.—Telegraph Construction & Maintenance Co. House service cut-out sets.—B.I. Cables. House service joint boxes.—Callender's. Meters.—British Sangamo Co.; Met.-Vick. Elecl. Co.

Croydon.—Electricity Committee. Recommended. Street lighting poles (£3,289).—Newport & South Wales Tube Co. Extension of 33,000-V ring main (£24,153).—Standard Telephones & Cables, Ltd.

Glasgow.—Transport Committee. Accepted. Magnet coils and cases.—Met.-Vick. Elecl. Co. Copper bonds.—B.I. Cables. Equipment for 100 tramcars: Electrical equipment, including electro-pneumatic remote control gear (£94,800).—B.T.H. Bogies, including air and magnetic brake equipment (£59,900). —Electro-Mechanical Brake Co. Copper trolley wire.—T. Bolton & Sons; I.C.I. Metals.

Electricity Committee. Accepted. Twelve 400-kVA and twelve 800-kVA transformers (£7,548).—Bruce Peebles & Co.

Irish Free State.—GOREY.—Board of Health. Accepted. Lighting at the District Hospital (£909).—Haden's Eng. Co.

NEW ROSS.—Board of Health. Electrical equipment in the County Fever Hospital:

	£		£
Electricity Supply Board. Accepted	**1,272**	Herbert Electrical Co.	1,436
M. F. Kent	1,382	Patrick Lynch	1,465
Rective Electrical Co.	1,392	Keating & Gaul	1,479

Kettering.—U.D.C. Accepted. One 1,000-kVA transformer (Spec. No. 79).—British Electric Transformer Co. Supplies for one year: E.h.v. and l.v. cables (Spec. No. 80).—Union Cable Co. A.c. meters (Spec. No. 81).—English Electric Co.; Chamberlain & Hookham; Ferranti, Ltd.; Venner Time Switches.

Leeds.—Library Committee. Accepted. Electric wiring at Sheepscar Library (£117).—Shaw Dale & Co.

London. — ISLINGTON. — Electricity Committee. Accepted. Electric cookers.—Hotpoint Electric Appliance Co.; Jackson Electric Stove Co.; Falk, Stadelmann & Co. Water heaters.—Heatrae, Ltd.; Santon, Ltd.; Aidas Electric, Ltd.

HACKNEY.—Electricity Committee. Recommended. Twelve months' supply of meter boards and switch blocks, electrical jointing materials (tapes only) and electrical installation material.—Siemens Electric Lamps & Supplies.

L.C.C.—Housing and Public Health Committee. Electric lighting, &c., in about 835 existing houses and flats at Becontree (Dagenham area, No. 11 contract):

	£		£
Ryland's Electrical Co. Accepted	**8,152**	Electrical Installations	*9,116
Ilford Electrical Co.	8,396	Jacob, White & Co.	9,276
Newman and Watson	8,509	Read & Partners	9,543
A. Meckbonik	8,510	S. Reed & Sons	10,048
City Electrical Co.	8,707	* After correction.	
Pinching and Walton	8,827	The chief engineer's comparable	
Evans and Shea	9,058	estimate is £8,562.	
Springvale Electrical Co. ...	*9,102		

STEPNEY.—Electricity Supply Committee. Twelve months' supply of cables:

	£		£
Britannic Cable & Construction Co.	5,790	British Insulated Cables... ...	6,814
		Pirelli-General Cable Works ...	6,849
Standard Telephones & Cables Recommended	**6,304**	Edison Swan Cables	6,901
		Metropolitan Cable Co.	6,918
W. T. Henley's Telegraph Works Co.	6,304	Telegraph Construction & Maintenance Co.	7,032
Nederlandsche Kabelfabriek ...	6,797	Johnson & Phillips	7,071
Derby Cables	6,809	Siemens Bros. & Co.	7,123

Recommended. Three-phase indoor and outdoor transformers for the period ending February, 1938.—Ferranti, Ltd. Switchgear during the period ending February, 1938: E.h.v. armourclad.—A. Reyrolle & Co.; truck type.—Crompton Parkinson; low voliage.—G.E.C. Street pillars during the period ending February, 1938.—B.I. Cables. Plugs and sockets for one year (£460).—Wholesale Fittings Co. Teak blocks for one year (£217).—Revo Electric Co. One year's supply of flexible cords (£104).—P. L. Dwyer & Co. Twelve weldless steel tubular lamp columns (£104).—Bromford Tube Co. Plant and machinery in connection with the change-over from d.c. to a.c.—A. Reyrolle & Co.; Met.-Vick. Elecl. Co.; G.E.C. Transfer of main transformer and rectifier, together with auxiliary equipment, from the Central sub-station to the Wapping sub-station, and providing additional gear, including transport and the necessary cable work, supplying and fixing (£1,057).—G.E.C. Control cables between the St. George's and Wapping sub-stations to secure the remote operation of equipment consequent upon the transfer of the above gear (£428).—Henley's. 5,000 cookers during the period ending February, 1939.—Revo Electric Co. L.v. distribution units during the period ending February, 1938.—English Electric Co.

BATTERSEA.—Electricity Committee. Recommended. Cables for three years: Callender's. Renewal of contracts for a further twelve months: Switches.—J. A. Crabtree & Co. Cut-outs, &c., and cooker control boards.—Foster Engineering Co. Water heaters.—Heatrae, Ltd. Supplies for twelve months: Electricity meters.—Chamberlain & Hookham; Ferranti, Ltd. Service joint boxes and house service cut-outs.—Callender's. Disconnecting boxes, steel sheathing, fixing clips, and insulating tape.—Henley's. Joint box compound.—Dussek Bitumen & Taroleum. Wire.—Stern Electric Co.; E. & E. Kaye; W. T. Glover & Co. Wiring accessories and glassware.—Falk, Stadelmann & Co. Switchplugs.—W. White & Co. Conduit and conduit fittings.—Mosers, Ltd. Cookers.—Jackson Electric Stove Co. Immersion heaters.—Santon, Ltd. Wash-boilers.—Brailsford Bros. Irons.—Revo Electric Co. Kettles.—Bulpitt & Sons.

BERMONDSEY.—Electricity Committee. Accepted. Extension of e.h.v. switchgear in the Elephant Lane sub-station (£567).—A Reyrolle & Co. Pilot control of, and feeder rectifier in, the Elephant Lane sub-station (£423).—Hewittic Electric Co.

Portland.—Electricity Committee. Accepted. Cables.—Hackbridge Cable Co.; Pirelli-General Cable Works. Meters.—Met.-Vick. Elecl. Co.; Smith Meters, Ltd. Service cut-outs.—W. Lucy & Co. Joint boxes.—Callender's (subject to approval of sample, otherwise W. Lucy & Co.). Compound.—Dussek Bitumen & Taroleum Co. Cookers.—Jackson Electric Stove Co. Cooker control units.—A. Reyrolle & Co.; Foster Engineering Co. Kettles.—Bulpitt & Sons. Wash-boilers.—Alder Electric, Ltd. Joint boxes.—Pirelli-General Cable Works. Transformers.—Bryce, Ltd. Switchgear.—Crompton Parkinson. Distribution boards and pillars.—W. Lucy & Co.

Smethwick.—Health Committee. Accepted. Electric lighting installation at the Clinic (£278).—Walker & Co.

South Africa.—CAPE TOWN.—Electricity Committee. Accepted. Central telephone system at the Electricity Offices (£2,194).—Rogers Henkins & Co.

Finance Committee. Accepted. City Hall floodlighting equipment (£1,235).—British General Electric Co.

Stockton-on-Tees.—Town Council. Accepted. H.v. switch for sub-station plant.—A. Reyrolle & Co. H.v. switchgear at Hartburn sub-station.—Crompton Parkinson. Switchgear for the Prudential sub-station.—Harland Engineering Co.

Tynemouth.—Housing Committee. Accepted. Electrical installation in 152 houses on the Ridges estate (£637).—J. M. Mylotte.

Notes

Forthcoming Events

On Friday, April 2nd, the Meter and Instrument Section of the Institution of Electrical Engineers is holding a meeting at the Institution, London, W.C.2, at 7 p.m., when Messrs. J. Prince and M. Whitehead will present a paper entitled "Coin Mechanisms, with Particular Reference to Electricity Meters." The Junior Institution of Engineers is holding an informal meeting on Friday, April 2nd, to be held at the Institution, 39, Victoria Street, London, S.W.1, at 7.30 p.m. The lecture will be on "The Elements of Efficient Power Transmission," by Mr. R. O. Baird.

I.E.E. Paper Prize

The triennial award of the Coopers Hill War Memorial prize (£20) and bronze medal is this year to be made by the Institution of Electrical Engineers for the best paper on any professional (electrical) subject selected by the Council. The paper must be specially written for the competition and reach the Institution not later than October 1st, 1937. Only corporate members who were under 35 years of age on January 1st are eligible.

South African Convention Report

The Association of Municipal Electricity Undertakings of South Africa and Rhodesia has issued a report of the proceedings of its fourteenth convention held at Johannesburg last November. The report extends to 344 pages and costs 5s.

Lubrication of Small Motors

Over three years ago, Messrs. Bull Motors inform us, a ¼-h.p. "Junior" motor was installed to drive a well pump near Ipswich. This machine is automatically controlled by a float switch and has been in continuous service until a few weeks ago, when an opportunity occurred to examine it. The "Oilite" bearings, made by the Manganese Bronze and Brass Co., which are standard for the Bull "Junior" range of fractional-h.p. motors, consist of a bronze bush of cellular structure impregnated up to about 35 per cent. of its total volume with oil. The surfaces of these bearings were found to have a film of clean oil; the running clearance of the bushes was shown by a plug gauge to be 0.0005 in., which is the maximum for new bearings. During the whole period the machine had received no additional oil and had not been examined.

Fatality

A verdict of "Accidental death" was returned at an inquest in Birmingham on John White (20), an apprentice electrical engineer employed at the General Electric Co.'s works at Witton, who received a fatal shock on March 16th while engaged in testing machinery. Oscar Purser, a tester of rotating machinery, said that White was working under his supervision; when the accident occurred they were both engaged at a switchboard, testing an alternator. It was decided to put the machine on load, and in order to do this White should have gone to another board, but for some reason, which witness could not understand, he went to a switch on the same board, and apparently used both hands to pull it out. This action would lead to a short-circuit and the voltage of 600 would pass through White. Dr. Stuart McDonald said death was due to asphyxia as a result of electric shock; the deceased man's physical state rendered him more susceptible.

The Electrical Association for Women

It is not generally realised that the electricity tariffs in towns in Great Britain are the lowest in the world, this, too, in spite of the country's not having the advantage of hydro-electric power. This fact was mentioned by Mr. F. Forrest, Birmingham city electrical engineer and president of the Incorporated Municipal Electrical Association, at the annual luncheon of the Birmingham and District Branch of the Electrical Association for Women last week. In the last few years, he said, we had belied our reputation for being rather conservative, at any rate in the matter of electricity supply. Great Britain was the only country with a grid system completed and the resulting reductions in generating costs would no doubt in turn lead to the lowering of charges. The availability of electricity would permit the building of factries in rural and semi-rural areas and the workers could have a much healthier life. Unfortunately, many people did not yet know what electricity could do for them, and in this direction the E.A.W. was doing much excellent work. Lady Bird presided at the luncheon, other speakers being the Lord Mayor, Lady Flower and Mrs. Vincent de Ferranti.

N.E.S.C.O.E. Association

The sixth annual dinner of North-East Coast Electric Supply Companies Old Employés will be held at the Hotel Metropole, Leeds, on Friday, April 2nd, with Mr. R. P. Sloan (president) in the chair. Serving members of the North-Eastern Supply Co. will be welcomed. Tickets (9s. 6d.) can be obtained from the hon. secretary, Mr. W. G. Bass, 506, Bush House, Strand, W.C.2.

Appointments Vacant

Lady showroom attendant for Morley Electricity Department.

Junior charge engineer for Newport Electricity Department.

Meter tester and repairer for Gloucester Electricity Department.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. F. Heaton has been co-opted on the board of the Bath Electric Tramways, Ltd., and has been elected chairman.

Messrs. Johnstone Wright, J. D. Peattie and **E. R. Wilkinson,** are leaving on April 28th for a visit to the United States where they will make a study of recent developments on behalf of the Central Electricity Board.

Mr. J. A. Henley, of the Metropolitan-Vickers Electrical Co., has been nominated for the chairmanship of the North-Western Students' Section of the Institution of Electrical Engineers for the session 1937-38.

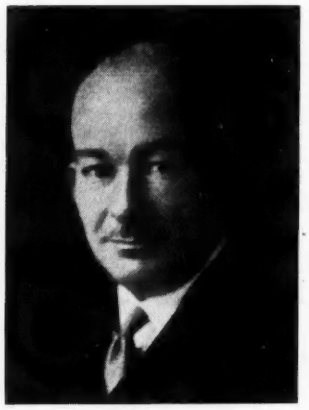
Miss Mabel G. Reading, who has worked with the City of London Electric Lighting Company, Ltd., for the past eleven years, has had to resign her position owing to a change of trading policy. She was in charge of their showrooms at Ludgate Hill, London, E.C. She was the first chairman of the Demonstrators' Circle of the Electrical Association for Women and helped the Association by training students in salesmanship and showroom work. Miss Reading has contributed articles on her particular subjects to the ELECTRICAL REVIEW.

Miss Hilda Wormald, supervisor-in-charge of the London Telephone Operating School, was presented with the British Empire Medal on March 17th by Major G. C. Tryon, the Postmaster-General. Miss Wormald entered the service of the National Telephone Co. in 1895, and became a supervisor in 1902.

Dr. F. Conrad, assistant chief engineer to the Westinghouse Electric and Manufacturing Co., has been awarded the 1936 Lamme Medal of the American Institute of Electrical Engineers.

Mr. G. N. Green, at present technical assistant with the British Insulated Cables, Ltd., has been appointed distribution superintendent with the Croydon Corporation Electricity Department at a salary of £674 per annum.

Mr. J. L. Wilson, the new chairman of the British Electrical and Allied Manufacturers' Association, is sales manager and a director of the British Thomson-Houston Co., Ltd., and has been a member of the Council of the Association since 1927. Educated at Lancing and the Yorkshire College (now the University of Leeds), Mr. Wilson started his engineering career in 1902 with the Brush Co. at Loughborough, where he remained until 1906 as assistant designer. In that vear he joined the General Electric Co., Schenectady, New York, and spent four years on constructional work in the United States, Brazil and Canada. He was transferred to the Engineering Department of the General Electric Co. in New York in 1910, and later was appointed engineer of that company's office in New-haven, Connecticut. During the War Mr. Wilson was commissioned in R.E. Signals, and on demobilisation joined the London office of the International General Electric Co. In 1923 he was transferred to the British Thomson-Houston Co., Ltd., and was appointed sales manager and a director in 1927.



Mr. J. L. Wilson

Mr. D. Smith has been nominated for the chairmanship of the North-Eastern Students' Section of the Institution of Electrical Engineers for the 1937-38 session.

Mr. H. Hind, Grad., I.E.E., has been appointed assistant consumers' engineer to the West Gloucestershire Power Co., Ltd. Mr. Hind received his technical training at Manchester College of Technology, and was for eight years sales representative with the Manchester Corporation Electricity Department. He is at present sales representative with the Walthamstow Corporation Electricity Department.

Mr. H. Hind

Mr. E. Moxon, A.M.I.E.E., borough electrical engineer of Southport, who has not enjoyed good health for some little time, has placed his resignation before his Committee. Before going to Southport in 1921 Mr. Moxon was borough electrical engineer of South Shields, and prior to that he was deputy borough electrical engineer at Blackburn.

Obituary

Mr. Archibald Robertson, general manager of the Rothesay Tramways Company, was at work on March 19th making preparations for the Easter traffic when he collapsed and died shortly afterwards. During and following the war Mr. Robertson was also in charge of the Greenock and Coatbridge tramway systems which were associated with the British Electric Traction Co.

Dr. Wesley M. Coates, of the Crocker Institute for Cancer Research of the Columbia University, was killed on March 20th when he came into contact with an uninsulated high-voltage copper conductor.

Councillor J. Tubb.—We regret to record the death of Councillor John Tubb, chairman of the Electricity and Lighting Committee of Ilford Corporation, which occurred on March 18th. Councillor Tubb had been chairman of the Committee since November, 1935.

Mr. A. Davy.—The death occurred on March 18th at Send, Surrey, of Mr. Augustine Davy, late managing director of the Weston Electrical Instrument Co.

Wills.—Col. H. J. Davis, one of the directors of the original Marconi's Wireless Telegraph Co., left £33,183, with net personalty £32,244.

Sir George B. Hunter, a director of the North-Eastern Electric Supply Co., left £152,363 (net personalty £140,920).

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Electrical Credit Services, Ltd.—Public company. Registered March 18th. Nominal capital, £5,000. Objects: To carry on the business of electrical and radio engineers, manufacturers and contractors, retailers and agents, to promote the use of electricity by developing the sale of all electrical and radio installations, electrical machinery, instruments, appliances, apparatus, wires, cables, accessories and other goods under hire-purchase and/or deferred payment terms, &c. The directors are: H. Marryat, 40, Hatton Garden, E.C., L. C. Penwill, Africa House, W.C.2 (director of N.E.C.T.A., Ltd., and E. A. Reynolds, 40, Gt. Charles Street, Birmingham. So long as N.E.C.T.A., Ltd., holds £100 shares it may appoint one director. Registered office: Africa House, Kingsway, W.C.2.

J. W. Woolley & Co., Ltd.—Private company. Registered March 8th. Capital, £1,000. Objects: To acquire the business of a manufacturer of and dealer in sterilising and water-heating equipment carried on by J. W. Woolley at Clifton, Staffs, and to carry on the business of electrical, metallurgical and mechanical engineers, electricians and contractors, manufacturers of and dealers in and letters on hire or hire-purchase of sterilising and heating equipment, electrical apparatus, &c. The subscribers are: J. W. Woolley, Clifton Hall, Tamworth; and J. C. Chaytor, Linden House, Polesworth, Tamworth. Solicitors: Johnson & Co., 36, Waterloo Street, Birmingham.

Somers Stockham & Smythe, Ltd.—Private company. Registered March 8th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in plain and decorative gas and electrical glassware, globes, bowls, shades, gas and electrical fittings, &c. The directors are: H. Somers, 22, Haughton Road, Birchfield, Birmingham, 20; W. H. Stockham, 18, Selborne Road, Handsworth Wood, Birmingham, 20; and M. C. Smythe, 50, Greenhill Road, Moseley, Birmingham, 13. Registered office: 63, Moor Street, Birmingham.

Refrigerator Rentals, Ltd.—Private company. Registered March 8th. Capital, £100. Objects: To carry on the business of manufacturers, designers, buyers, suppliers,, renters, repairers, exporters and importers of and dealers in and agents for refrigenerators and all types of electrical apparatus, machinery and appliances, &c. The subscribers are: R. A. Holden and H. S. Smith, both of 5, John Street, W.C.1. Solicitors: Richardson, Sowerby, Holden & Co., 5, John Street, Bedford Row, W.C.1.

Hewelectric Co., Ltd.—Private company. Registered March 12th. Capital, £300. Objects: To carry on the business of electricians and radio dealers, &c. The subscribers are: G. E. Hewett, 107, Kenton Road, Harrow; and L. A. R. Findjan, 47, Boxtree Road, Harrow Weald. Solicitors: Wedlake Letts & Birds, 11, Serjeants Inn, E.C.4.

Elliott Madams & Co., Ltd.—Private company. Registered March 9th. Capital, £1,500. Objects: To acquire the business of electrical engineers carried on by J. I. Elliott and H. C. Madams as Elliott & Madams, &c. The permanent directors are: J. I. Elliott, 16, St. Edmund's Drive, Stanmore, Mdx.; and H. C. Madams, 43, Woodhouse Grove, Manor Park, E.12. Secretary: Jas. Lonie, 3, Claremont Gardens, Whitley Bay.

Ibbett Bros., Ltd.—Private company. Registered March 11th. Capital, £500. Objects To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus and accessories, and in particular radio sets and valves, gramophones, radio gramophones, television sets, &c. The directors are: C. V. Ibbett, "Redlands," Ridge Road, Kempston, Beds, and S. Ibbett, 71, Elstow Road, Kempston. Registered office: 1-3, St. Paul's Churchyard, E.C.4.

E.S.S. Signs (Finance), Ltd.—Private company. Registered March 10th. Capital, £100. Objects: To carry on business as a finance company, to purchase with the object of resale on hire-purchase or deferred payment terms electrical and mechanical signs and apparatus, wireless sets and accessories, dynamos, electrical plant, &c. The directors are: R. Bradfield, Holmwood Park, Holmwood, Surrey, and three others. Registered office: Duke's Road, Western Avenue, Park Royal, W.3.

West Cornwall Refrigerator Co., Ltd.—Private company. Registered March 11th. Capital, £100. Objects: To carry on the business of dealers in and agents for the sale of refrigerators, vacuum cleaners, wireless apparatus, water softeners, &c. The directors are: C. L. Bunt, 2, Ascott Avenue, Ealing, W.5, and A. P. Bunt, 13, Mount Park Crescent, Ealing, W.5. Registered office: 22, New Broadway, Ealing, W.5.

Wireless Manufacturers & Trade Service (Western), Ltd.—Private company. Registered March 8th. Capital, £1,500. Objects: To acquire the business of a radio manufacturer and trade service heretofore carried on by C. E. Jowett at 78, East Street, Bedminster, Bristol. The subscribers are: C. E. Jowett, 18, Hamilton Road, Southville, Bristol, 3; and A. W. J. Colston, 20, Clark Street, Stapleton Road, Bristol. C. E. Jowett is the first director.

Crabtree's Radio, Ltd.—Private company. Registered March 9th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in gramophones and sound reproducing machines, automatic machines, dictaphones, calculating and adding machines, electric accumulators and batteries, wireless aerials, wireless and electrical components and apparatus, &c. The directors are: R. W. Hellyer, 7, Hollingwood Lane, Bradford; and H. Crabtree, 33, Nab Wood Drive, Shipley. Secretary: R. W. Hellyer. Registered office: 21, Market Street, Bradford.

Electrical Equipment (Hove), Ltd.—Private company. Registered March 6th. Capital, £250. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, insulators, transformers, &c. The directors are: T. Warren, "Four Ways," Woodland Drive, Hove; L. F. Russell, 19, Beechers Road, Mile Oak, Portslade, Sussex; and R. A. Clarkson, 130, Ditchling Road, Brighton. Registered office; 204, Portland Road, Hove, Sussex.

Speed Radio, Ltd.—Private company. Registered March 10th. Capital, £500. Objects: To carry on the business of manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus and accessories, and in particular of wireless sets, radio sets and valves, gramophones, radio-gramophones, television sets, &c. The subscribers are: Mrs. S. Isaacs, 732, Romford Road, Manor Park, E.12; and N. C. Coulson, 15, Buxton Road, Newbury Park, Essex. Mrs. Isaacs is the first director.

Luminous Electric Appliances, Ltd.—Private company. Registered March 10th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, luminous sign and appliance manufacturers, &c. The directors are: Wm. M. Holt, 7, Halton Road, Sutton Coldfield; J. E. Holloway, 21, Sycamore Road, Birmingham, 6; and E. H. Weaver, 13, Bromford Lane, Erdington, Birmingham.

F. Horsfield & Co., Ltd.—Private company. Registered March 8th. Capital, £4,000. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, insulators, stoves, cookers, rubber-insulating materials, electrical wiring, fittings and plant, &c. The subscribers are: E. L. Craig, "Sunrising," Ardleigh Green Road, Hornchurch, Essex; and F. R. Collison, 8, Eldon Park, South Norwood, S.E.25. F. W. Horsfield, senior, 16, St. Anne's Court, Oxford Street, W., shall, on his becoming a director, be governing director for life. Registered office: 16, St. Anne's Court, Oxford Street, W.1.

Returns of Electrical Companies

Bursiem's Patents, Ltd.—H. A. Snelling, of Columbia House, Aldwych, W.C.2, ceased to act as receiver on February 25th, 1937.

Wycombe (Borough) Electric Light and Power Co., Ltd.—Satisfaction in full on December 31st, 1936, of debentures authorised by resolutions of April 6th, 1899, March 21st, 1902, and January 6th, 1920, secured by trust deeds dated April 27th, 1899, and July 16th, 1902, and registered August 1st, 1902, April 18th, 1900, and February 5th, 1920. (Notice filed March 8th, 1937.)

Brush Electrical Engineering Co., Ltd.—Debenture dated February 16th, 1937, to secure £80,000 charged on properties in Loughborough (subject as to part thereof to trust deed dated September 4th, 1908), certain shares and stocks, and the company's undertaking and property, present and future, including uncalled capital (subject to deeds dated March 14th, 1892, November 1st, 1899, and September 4th, 1908). Holders: C. Hoare & Co., 37, Fleet Street, E.C.

Electrical Appliance Investment Co. (Cornwall), Ltd.—Particulars filed of £2,000 debentures, authorised March 5th, 1937, charged on the company's property, present and future, including uncalled and unissued capital, the amount of the present issue being £600.

Weston Electric Lamp Co. (1933), Ltd.—Capital, £200 in £1 shares. Return dated February 16th, 1937. All shares taken up. £200 paid. Mortgages and charges, £550.

Weston Electric Lamp Co., Ltd. (Old company).—T. Smith, C.A., of 17, St. Swithin's Lane, E.C.4, ceased to act as receiver and/or manager on March 5th, 1937.

Bedford Park Transmissions, Ltd.—Capital, £11,000 in 10,000 "A" shares of £1 and 20,000 "B" shares of 1s. Return dated December 31st, 1936. 3,919 "A" and 20,000 "B" shares taken up. £589 paid on 589 "A" shares. £4,330 considered as paid on 3,330 "A" and 20,000 "B." Mortgages and charges, nil.

Electrical & Steam Appliances, Ltd.—Capital, £100 in £1 shares. Return dated September 14th, 1936. Two shares taken up. £2 paid. Mortgages and charges, nil.

Mosbrough Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 10th, 1936. 3,275 shares taken up. £3,275 paid. Mortgages and charges, nil.

Durham and District Electric Traction Co., Ltd.—Capital, £30,000 in £1 shares. Return dated December 21st, 1936. Seven ordinary shares taken up. £7 paid. Mortgages and charges, nil

Lithanode Co., Ltd.—Capital £3,000 in £1 shares. Return dated December 3rd, 1936. 2,327 shares taken up. £627 paid. £1,700 considered as paid. Mortgages and charges, £5,000.

Philips Lamps, Ltd.—Capital, £100,100 in 100,000 shares and 100 "B" shares of £1. Return dated September 30th, 1936. All shares taken up. £100,100 paid. Mortgages and charges, nil.

Dolywern and District Electricity Supply Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 11th, 1936 (filed December 28th, 1936). All shares taken up. £1,000 paid. Mortgages and charges, £400.

Lumolite, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated February 15th, 1937, to secure £5,000. Holders: Braemore Trading Co., Ltd., Sundridge Avenue, Bromley.

Nivalight (1928), Ltd.—Particulars filed of £1,000 debentures authorised March 2nd, 1937, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Bournemouth and Poole Electricity Supply Co., Ltd.—Satisfaction to the extent of £187,500 on January 1st, 1935, of debenture stock authorised by resolutions of March 5th, 1900, July 16th, 1903, and May 21st, 1908, and registered October 22nd, 1903, and June 5th, 1908.

S. G. Brown, Ltd.—The nominal capital has been increased by the addition of £40,000 in £1 ordinary shares beyond the registered capital of £10,000.

Midland Counties Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £1,500,000 beyond the registered capital of £5,000,000. The additional capital is divided into 1,500,000 unclassified shares of £1. The 2,000,000 preference shares of £1 have been converted into preference stock and the 3,000,000 ordinary shares of £1 into ordinary stock.

H. A. Stonham & Co., Ltd.—H. W. T. Sinden, of 12, Lonsdale Gardens, Tunbridge Wells, was appointed receiver and/or manager on February 26th, 1937, under powers contained in debentures dated May 14th, 1936.

Anti-Vibration Electric Lamp Co., Ltd.—J. H. G. Peterken, of 17/18, Basinghall Street, E.C.2, ceased to act as receiver and/or manager on February 27th, 1937.

Berkeley & Young, Ltd.—Capital, £22,000 in £1 shares (subdivision not stated). Return dated September 26th, 1936. 6,276 preference and 11,520 ordinary shares taken up. £7,786 paid on 6,276 preference and 1,510 ordinary shares. £10,010 considered as paid on 10,010 ordinary shares. Mortgages and charges, nil.

City Notes

The Scottish Power Co., Ltd.—Presiding at the annual meeting held on March 19th, Mr. G. Balfour (chairman) said that all their subsidiary companies continued to make steady progress. They had acquired the Berwick-upon-Tweed undertaking from the Edmundson group early last year and had been responsible for its administration during the last six months of 1936. In the northern portion of the borough they were inaugurating an a.c. supply and had reinforced the d.c. supply. During the year they had obtained a Special Order authorising supply to be given by the Scottish Southern Co. in North Northumberland, embracing 166 square miles, and they had also taken over the undertaking of the Tain Corporation which completed the consolidation of supplies in the area of their Ross-shire Co. Supplies were now afforded by the parent company and its subsidiaries to an area of more than 12,000 sq. miles, with an average density of population of only 119 per sq. mile. Last year certain plants serving local areas were shut down and this year they intended to close three or four small plants of this description in accordance with their scheme of unification. The driving of the tunnel to connect Loch Garry and Loch Ericht should be completed by the middle of this year and be put into service during the autumn. This would provide 10,000 kW for immediate requirements. On the completion of the Loch Garry works the

Cuaich-Seilich development would be started, which would provide a further 11,000 kW. Additions to the high- and low-voltage mains amounted to 463 miles, making the total mileage of the mains of subsidiary companies at the end of 1936 2,901 miles. In addition, during the year they erected eighty-five miles of 132,000-V transmission line from Tummel to Keith, making a total of 150 miles of 132,000-V transmission owned by the Grampian Co. They now had 3,000 cookers on hire and a large number of wash-boilers, water-heaters, &c. These services were linked to twelve showrooms from Dingwall to Duns and Berwick. During 1936 the new consumers connected amounted to 10,429, a record, making the total 60,790, double the number connected four years ago. Another twelve burghs and thirty-five villages were added to their supply during the year, increasing the total number of burghs supplied to ninety-one and villages to 217. Public lighting supplies during 1936 were inaugurated in eight burghs and thirteen county districts, and they now afforded street lighting supplies to 164 lighting areas in sixty burghs and 104 county districts. The extra load during the year was 27.560 kW, making the total connected load to December 31st, 1936, 202.760 kW. The maximum demand in all areas was 54,500 kW, and they sold under contract a maximum demand of 34,500 kW to the Central Electricity Board, making a total maximum demand during the year of 89.000 kW. Sales of electricity last year amounted to 254,000,000 kWh, including 109,700,000 kWh sold to the Central Board, but excluding bulk supplies to associated undertakings, an increase of 17,600,000 kWh over the preceding year. The price per kWh to the consumers of the subsidiary companies averaged 1.268d., as compared with 1.29d. in 1935.

Lancashire Dynamo & Crypto, Ltd., held its annual meeting on March 18th. In the absence of Mr. A. E. L. Chorlton (chairman) Mr. H. W. Bosworth (managing director) presided and read his speech, in which he said that every section of the company had been fully occupied during the year and a record output had been obtained in the number of machines, tonnage and money value. It was due to this that the profits were so satisfactory; actual price increases in electrical machinery had so far been only moderate. The increase in output from the factories was made possible by the use of newer machinery and improved organisation. Last autumn further extensions had become necessary at Willesden and three new bays were now being built. New machinery and plant purchased during 1936 had been on a larger scale than usual. Lancashire Dynamo & Crypto (Canada), Ltd., had been finally wound up during the year and the profit made thereby had been used to increase the reserve against investments in other companies and bad debts. The remainder of the outstanding debentures were redeemed in January. The prospects of their subsidiary, Crypton Equipment Co., appeared very satisfactory, and Bepco, Ltd., the Canadian company, was sending increased orders. Satisfactory results were also being obtained by Dynamo Motor Repairs, Ltd., and Ferrous Light Castings, Ltd., while an increased turnover had been experienced by their food machinery section. At Willesden there had been a steady annual rise in output and with the reorganisation and extensions taking place there they should be in a position to take better advantage of opportunities existing. The volume of business handled by the Crypton Equipment Co. had exceeded expectations and the capital employed in this section of the business would increase considerably. They commenced the current year with a larger order book than they had had for many years, and orders to date were in excess of those received in the corresponding period of 1936.

Switchgear & Cowans, Ltd., held their annual meeting on March 16th, when Mr. H. Burroughs (chairman), who presided, said that the present board took over control of the business in May, 1936. The company had had a successful year's trading, the profit being almost double that for 1935 and more than double the average for the last five years. The value of unexecuted orders was 50 per cent. greater than that for the previous year. The orders now on the books were also substantially greater than they were this time last year. They were extending the factory, which would enable them to give earlier deliveries and would also enable them to effect economies in the cost of production. They had also added to the plant and replaced other plant by more modern equipment. In the autumn of last year they purchased the shares of a subsidiary company which was supplying them with a large part of their raw and semi-manufactured materials. In order to finance the extensions to the factory and to extinguish the loan secured from the bank to complete the purchase of the subsidiary, they proposed to increase the authorised capital of the company to £150.000 and to issue 80,000 new shares of a nominal value of £20.000. The Committee under the chairmanship of Sir Harry McGowan had recommended standardisation of systems in order to lower costs of electrical energy to the consumers. This meant that there was a strong possibility of further orders for the electrical industry and they hoped to get their share. Steps had been taken of a technical character which had put them in the position of being able to secure orders from a large number of new customers who had hitherto been unable to place orders with them. These steps referred to special tests to ascertain the rupturing capacity of their switchgear. The tests were carried out in the presence of the superintendent of the Faraday House Testing Laboratories and they proved that their switchgear left nothing to be desired.

The South London Electric Supply Corporation, Ltd., held its annual meeting on March 19th, when Lord Gainford (chairman), who presided, said that the sales of electricity to consumers showed an increase of 21 per cent. Towards the end of last year a further reduction in the flat rate for lighting from 5d. to 4½d. per kWh was announced and the reduced rate came into operation at the beginning of the current year. They had received a further contract from the local authority to light another thirty-five miles of streets in Lambeth, which now gave them a total of fifty-seven miles of electrically lighted streets in the borough. With regard to the McGowan Committee's findings on the reorganisation of the distribution of electricity in this country, their company, the County of London Co., and the South Metropolitan Electric Supply Co. were closely bound together and worked jointly under mutual directors and the same management. That joint working arrangement was to be extended by including the City of London Electric Lighting Co., and the necessary agreement for this purpose was now awaiting the approval of the Electricity Commissioners. They were supplying free electricity to the local authority for the Coronation celebrations for the purpose of floodlighting and display.

Brown Bros., Ltd., report a net profit for the year ended January 16th of £92,645, as compared with £87,087 in the preceding year, to which is added £63,862 brought in. Reserve receives £20,000, employés' funds £5,000, and the final dividend on the 454,000 old ordinary shares is 10 per cent., making 12½ per cent. (against 11¼ per cent.), leaving £80,368 to go forward.

Presiding at the annual general meeting held on March 18th Mr. J. A. Thomson (chairman and managing director) said that throughout 1936 the home trade had been good in every department and had created new records both as regards total value and volume of business done and they looked forward to another busy year in 1937. The radio industry had been suffering from over-production and the bulk of retail sales to-day were made on hire-purchase, which, because of the depreciation due to changes in design in radio receiving sets, was not the most satisfactory form of trading. They had therefore restricted their hire-purchase business. The great increase in the use of electricity had been reflected in the demands on their electrical department, which had enabled them to increase their turnover and had also been the means of absorbing any surplus staff from the radio department. They had recently introduced a lighting engineering service which placed at the disposal of their customers expert advice on all aspects of lighting and equipment. It specialised in floodlighting of factories, workshops, petrol stations, showrooms, &c., and had already proved a valuable adjunct to the electrical section of the business.

London Associated Electricity Undertakings, Ltd.—Presiding at the annual meeting held on Tuesday last Sir Francis Fladgate (chairman) said that considerable progress had been made in the reorganisation and centralisation proposed last year and arrangements had now been made by which the six companies would act under their control. Progress towards standardising the tariffs had also been made and a form of tariff had been issued common to all six companies, to operate as from January 1st last, with two exceptions. Work of standardising the distribution systems had continued, especially in domestic areas. During the coming year those of the Brompton and Kensington and Knightsbridge Companies' areas would be standardised. The work had been largely completed in the areas of the Westminster, Chelsea and St. James' Companies, and by the end of this year only the Charing Cross Co.'s system would be to any large extent on non-standard lines. Expenditure on change-over in the current year would amount to £200,000; in 1936 the proportion of a.c. supply to the total kWh supplied was 66 per cent., against 60 per cent. in 1935. With regard to the recommendations of the McGowan Committee, they had, in collaboration with other companies affected by the 1925 Acts, considered the best methods of co-ordination and they were hopeful of arranging a scheme in the interest of shareholders and consumers alike which the Government would be prepared to ratify in due course. In the combined distributing undertakings for 1935 and 1936 the increase in kWh sold amounted to 36,000,000. The average price per kWh from consumers of the six companies during the year was 1.624d. per kWh, as compared with 1.682d. per kWh in the preceding year. Prospects for the future were good.

The Bournemouth & Poole Electricity Supply Co., Ltd., held its annual meeting on March 23rd, when Sir Bernard Greenwell (chairman), who presided, said that they sold over 47 million kWh during the year under review, an increase of 29 per cent. as compared with the previous year, and their sales of electricity had been more than doubled during the past five years; the increase in the number of consumers during those five years had been 94 per cent. Modifications were made to their tariffs to the benefit of consumers. They had extended their supply into the rural areas and opened up 45 villages and hamlets, which had involved establishing over 100 points of distribution. During the year they added over thirty-two miles of h.v. lines and 132 miles of l.v. mains, and connected up an additional 7,097 consumers, an increase of 16 per cent. as compared with the previous year. The kWh sold under the two-part tariffs represented 70 per cent. of the total sales to ordinary consumers for lighting, heating, and cooking. An amicable agreement had been arrived at in the local authorities under the Bournemouth, Poole, and Christchurch Electricity Act, 1932, with regard to the revision of rates of supply. New showrooms and offices had been opened at Poole. They were supplying electricity free to local authorities for the floodlighting of public buildings and the decoration of streets during the Coronation celebrations.

J. & F. Stone Lighting and Radio, Ltd.—It is reported in several financial newspapers that Mr. J. C. Gardner, chairman of this company, has issued a circular to shareholders discussing the affairs of the company and intimating that he considers it desirable to resign his directorship as from March 31st. It is stated that Messrs. John Stone and B. Usick, the managing directors, do not agree with Mr. Gardner on the subject of the duties of chairman. It is further added that Mr. Norman Wild has been appointed a director and that he will in due course be appointed chairman. Mr. Gardner in his circular states that the accounts for the half-year ended December 31st show a substantial increase in net profits and that the hire-purchase department carried on as a subsidiary company has developed rapidly. Mr. Gardner claims that he should not only exercise a general supervision, as chairman, but should also share responsibility for, and have an intimate knowledge of, the affairs of the company. He is not content with simply attending board meetings and addressing shareholders.

Trafalgar Engineering Co., Ltd.—The list of applications opened and closed on Tuesday last in an offer for sale of 725,000 ordinary shares of 2s. each at 3s. 6d. per share. The company was incorporated as a private company on February 26th, 1937, under the name of Trafalgar Electrical Machinery Co., Ltd., changed its name to its present title on March 3rd

and was converted into a public company on March 18th. The company has been formed to acquire, as from January 15th, 1937, the undertaking, assets and business of electrical machinery engineers carried on by the vendor company, Trafalgar Engineering Co., Ltd. (now called "Trafalgar-Bennett Holdings, Ltd."). The main business is that of engineers specialising in the manufacture of electrical plant, particularly cable-making machinery for electric, telephone and submarine cables.

Pinchin, Johnson & Co., Ltd.—Presiding at the annual meeting held on March 22nd Mr. G. Robson (chairman) said that their sales for the past year represented another record. All departments, both at home and overseas, had contributed to obtaining this result. Price conditions had not been entirely satisfactory, advances in selling prices of their products completely lagging behind the increases in cost of raw material and labour. It was only now that these conditions were making themselves felt sufficiently to bring about some little co-operation in the paint industry. Mr. R. Paltridge (managing director) said they had opened the year well, the sales each month showing a gratifying advance, and now that the problem of price debasement was being taken care of by the trade as a whole that in itself would contribute materially to their own results.

The British Power & Light Corporation reports that interest dividends and sundry receipts for 1936 amounted to £201,539, an increase of £22,956, as compared with 1935. Fees and expenses totalled £6,585, and taxes £40,500. The ordinary dividend is maintained at 6 per cent., and the carry-forward is increased by £20,820 to £62,015. The report states that the operations of the subsidiary companies during the current year to date continue to progress.

The North Wales Power Co., which is controlled by the British Power and Light Corporation, reports a net profit for 1936 of £91,369, as compared with £95,207 in the preceding year, to which is added £698 brought in. From this is deducted tax, £24,000, and contingencies reserve receives £10,000. The dividend for the year is maintained at 7 per cent., less tax, and £4,691 is carried forward. The report states that the sales of electricity to main classes of consumers totalled 101,841,191 kWh, an increase of 10.6 per cent. At the annual meeting on March 30th a resolution will be submitted for increasing the capital to £2,000,000 by the creation of 2,000,000 new ordinary shares of 10s. each, the proceeds of which will be utilised for repayment of the 7 per cent. debentures, loan from the British Power and Light Corporation, and for general purposes of the company.

The Newcastle and District Electric Lighting Co., Ltd., held its annual meeting at Newcastle on March 19th, when Sir Frank R. Simpson (chairman), who presided, said that the increase in receipts of £7,899 was satisfactory when it was taken into consideration that a further reduction in charges was made from April 1st representing a sum of £4,638 for the year. The sales of electricity exceeded those of the previous year by approximately 3,000,000 kWh, equal to an increase of 12 per cent., and this was spread over all classes of consumers. There was an increasing demand by domestic consumers for supplies for cooking and water-heating apparatus. The Newcastle Corporation had under consideration the question of exercising its rights of purchase of the company's undertaking.

The British Aluminium Co., Ltd., announces a profit of £361,158 (£302,227) for 1936 including amount brought forward and after providing for taxation and debenture interest and allocating £50,000 (same) to depreciation reserve (making £1,300,000) and £50,000 (nil) to the reserve fund (making £1,250,000). The directors recommend a dividend of 10 per cent. (against 7½ per cent.) on the ordinary shares, leaving £71,158 (£62,227) to be carried forward. Following the annual meeting on March 31st an extraordinary meeting will be held at which a resolution will be submitted for increasing the capital of the company to £7,000,000 by the creation of 2,500,000 additional ordinary shares of £1 each, to be issued as the board may from time to time determine.

The Plessey Co., Ltd.—Particulars of this company were published on Monday last for information only. The company was incorporated as a private company in February, 1925, when it took over an undertaking of similar name and it was converted into a public company on March 17th last. Its business consists in the main of the mass production of an extensive range of components used in electrical and mechanical engineering and by the radio, telegraph and telephone, and motor car trades. Its products include telephones, telephonic and telegraphic apparatus for the G.P.O., radio transmitting and receiving equipment, &c., for the Air Ministry, Admiralty, War Office and Colonial Governments, and complete wireless receivers, and components for radio set manufacturers.

The Watford Electric and Manufacturing Co. reports a profit for the initial period June 25th to December 31st, 1936, of £7,609, from which is deducted provision for tax (£1,611), preference dividend for the period (£1,249) and the balance of preliminary expenses written off (£584), leaving £4,165. It is proposed to pay a dividend of 7½ per cent. actual (less tax), on the ordinary shares and to carry forward £790. The report states that orders received since January 1st, 1937, are more than 50 per cent. upon the same period last year, and in order to cope with this increased business a further extension of approximately 18,000 sq. ft. of floor space is at present in process of erection.

G. D. Peters & Co., Ltd., report a profit of £21,912 for 1936, as compared with £2,162 in the previous year. The profit is transferred to reorganisation account, the balance of which is thus reduced to £254,715. Nothing has been included in the accounts in respect of profits of subsidiary companies, and no subsidiary made a loss last year. The dividends on the 6 per cent. cumulative participating preference shares are in arrear from July 1st, 1925. The directors state that trading conditions improved considerably and that the principal departments were well supplied with orders.

Ericsson Telephones, Ltd., reports a trading profit of £236,801, an increase of £62,092. A sum of £13,640 is provided for depreciation and £20,277 is allocated for income tax. The net profit is £140,602, an increase of £28,174, out of which £35,000 is placed to general reserve. The final ordinary dividend is 12 per cent., plus a bonus of 7 per cent., making the total distribution for the year of 25 per cent. (against 20 per cent.), and £35,762 is carried forward, against £37,917 brought in.

The Shropshire, Worcestershire and Staffordshire Electric Power Co. report a revenue for 1936 of £312,118, as compared with £707,327 in 1935, which with £54,294 brought in, makes £866,412. Rates, directors' fees, interest, &c., absorb £267,751, and £225,000 is placed to reserve. The dividend on "A" ordinary shares is maintained at 8 per cent., and the dividend on the "B" ordinary is raised from 6 to 6½ per cent., leaving £55,411 to be carried forward.

The Telephone and General Trust has declared a final dividend of 5 per cent. on the ordinary stock, making 8 per cent. for the year. It is also proposed to pay a dividend of 8 per cent. on the "A" ordinary shares. Both these dividends are at the same rate as for the preceding year.

The Woking Electric Supply Co. is paying final dividends on the old ordinary shares, Nos. 1/73922 at the rate of 6⅔ per cent. (against 5 per cent.), and on the bonus ordinary shares Nos. 73923/147844 at the rate of 3⅓ per cent., both tax free.

Lissen, Ltd., announces a dividend on the preference stock at the rate of 8 per cent. per annum, less tax, for the three months ending March 31st.

Hopkinsons, Ltd., propose to pay a final ordinary dividend of 7½ per cent., less tax, making 10 per cent. for the year (against 8⅓ per cent.).

The Midland Electric Corporation for Power Distribution is paying a final dividend of 6 per cent. on the ordinary shares, making 9 per cent. for the year, less tax (against 8 per cent.).

The Marconi International Marine Communication Co. proposes to pay a final dividend of 5 per cent., less tax, maintaining the distribution for the year at 7½ per cent.

La Société Financière de Transport et d'Entreprises Industrielles (Sofina) announces a dividend of Frs.440 net (same) per share on its ordinary capital.

The Isle of Thanet Electric Supply Co. has announced a dividend of 4 per cent. (same) for 1936.

The Montreal Light, Heat and Power Consolidated is paying a quarterly dividend of 37 cents (same).

Stocks and Shares

Monday Evening.

THE week preceding the Easter holidays is never particularly profitable in the Stock Exchange, from the point of view of business activity. People are thinking more about time-tables and hotels than of stocks and shares. In this present year, political uncertainties at home and abroad are exercising a good deal of restraint upon the willingness of the public to spend money in Stock Exchange securities. The fixing of the Budget date—April 20th—is a definite reminder of the possibility of further taxation, although in some quarters advance, if not authentic, consolation is being offered to those who anticipate an increase in the income-tax.

During each of the past few weeks, the fluctuations in prices shown in our lists have been exceptionally numerous and varied. Although the changes are not quite so many this week as they have been of late, there are sufficient to afford an index to the general trend of investment in the industrial sections. Gilt-edged stocks hold their prices with tolerable steadiness. New issues are being taken none too readily. The fact of a subscription-list closing within a few minutes of its having been opened is not, nowadays, evidence of the issue having been over-subscribed by the public. Proof of this point will be supplied, perhaps a little acidly, by underwriters of certain of the newcomers. French and Belgian selling is an unwelcome feature in various markets. Wall Street is disturbed by fears of fresh restricting legislation.

Electricity Supply Shares

Taking their tempo from the gilt-edged market, Home electricity supply issues have succeeded during the past week in scoring a modest improvement in prices. While only a few shares added to the depreciation of the previous weeks, others show a marked recovery. The latest batch of reports issued by the companies has been a helpful factor in transferring the investor's attention from the question of immediate yields to the prospect of future progress in profits and dividends. The first and unfavourable effects of the Government's announcement of intended action on the lines of the McGowan Committee's report, appear to be wearing off, together with apprehensions of any serious interference with the fortunes of individual companies.

Price Movements

The declaration of an unexpected 1 per cent. increase in the Midland Electric Power dividend caused a rise in the price of the shares from 38s. 9d. to 41s. 3d. At the new rate of 9 per cent., the return on the money works out at £4 7s. 6d. per cent. After the respective annual meetings, North Metropolitans gained 1s. 3d., to 50s., and County of London 1s., to 50s. Midland Counties strengthened to 38s.: subscription lists to the company's offer of 4½ per cent. preference shares, at 20s. 6d. per share, were closed at the end of last week. Metropolitans were not affected by the proposal of an early issue of ordinary shares. British Power and Light responded to the report with a small rise to 27s. 3d., and Edmundsons recovered well at 41s. Others to show some improvement were Yorkshire Electric, Scottish Power and Newcastles. Isle of Thanet, on the other hand, gave way from 24s. to 22s. 6d. In the foreign group, Perak Hydros, at 30s. 9d., are quoted ex-rights

to the offer of new shares, on a one-in-four basis, at 27s. per share. The price opened on the basis of 2s. 6d. premium, rising later to 3s. 4½d. premium. Palestine Electric "A" shares have fallen below 40s.; Jerusalems, at 29s. 6d., are also depressed.

Vickers

For national reasons, this year's report by Vickers was awaited with more than the usual amount of interest. The 10 per cent. dividend declared is 2 per cent. higher than the previous distribution, and is being paid on capital increased by last year's 50 per cent. capital bonus. Publication of the accounts showed the expected big expansion in profits, equivalent to more than 15 per cent. on the present capital. Taking into account the austerity of the company's financial policy, the market is well satisfied with the results. The price of the stock, which is divided into 10s. units, has moved in a fashion disappointing to holders, falling to 33s. 9d. ex-dividend, as compared with about 36s. before the results were known. The principal reason for the decline, apart from the general malaise in the industrial markets, is the absence of a capital bonus from this year's distribution. Optimists are disappointed that the process of writing-up the value of the stock units has not been carried a step further. The current yield on the stock is a little under 3 per cent. The importance of the part played by the electrical industries in national rearmament was stressed, the other day, by the Minister for Co-ordination of Defence. Vickers has a substantial stake in Associated Electrical Industries.

Electrical Equipment Market

The dullness which has affected industrial markets as a whole since the beginning of the year shows no more than a glimmer of amelioration. There is little sign, as yet, of a stiffening of confidence, or of a reawakening of curiosity on the part of the bargain-hunter. So far as electrical equipment shares are concerned, indications of improvement are generally limited to a steadying of prices at their lower levels. British Insulated remain depressed at 6½, despite the expansion of profits disclosed in the accounts. Included in the price are the final 15 per cent. distribution and rights to the 20 per cent. scrip bonus. Enfields have dropped to 5 7/16; other leading cable shares are mostly steady. The dividend on Associated Electrical is expected to be declared this week. The price of the shares has rallied in the meantime to 52s. English Electric issues turned dull with the nearness of the report, the ordinary, at 34s., and preference, at 24s., each falling 1s. Crabtrees picked up 2s. 3d., to 32s. 9d., ex-dividend. Switchgear and Cowans receded to 17s. 6d., ex-dividend, and Consolidated Signals to 128s.

American Markets

Following a lengthy period of indecision and uneasiness, American stock markets have given way to a bad attack of nerves in the past few days. The growth of labour disputes and strikes has put a severe strain on bullish anticipation of rapid industrial recovery; a still more telling weight has been added in the shape of a succession of officially inspired warnings against the perils of boom conditions. Fears of imminent and drastic intervention by the Government to prevent the threat of inflation became so acute as to provoke a wave of selling in all the United States markets. Many stock prices broke, as a result, with characteristic severity. American Telephone and Telegraph shares are 5 points down at 173½. Internationals at 14 and Western Unions at 76 have escaped any loss worth mentioning. Amongst other dollar stocks, Brazilian Tractions have been turned out by Brussels and by Montreal, the price being 2 points down on the week at 26.

Cable and Wireless

The firmness of prices for Cable and Wireless stocks was consolidated by the traffic index figure for February. The upward trend in traffics which started towards the end of last year is well maintained; comparison with the corresponding figures for 1936 again shows a sizable improvement. The market is not disposed to place undue importance on the decline in the index below the January level, although in previous years February traffics have almost invariably been heavier than those of the earlier month. The preference and "B" ordinary stocks are unchanged. The "A" ordinary, after rising to 30¼, reacted to 29½, showing a net loss on the week of ½. Weakness persists in Great Northerns, which have fallen 30s. to 42. Marconi Marines gave way from 36s. 3d. to 35s. Hopes of an increase in this year's dividend were finally dissipated by the announcement of a repetition of the previous rate of 7½ per cent.

Miscellaneous Matters

British Electric Traction deferred stock has shed 25 points, receding to 1,475. A fall of 2, to 20½, in Anglo-Argentine Tramways 5 per cent. debenture reflects a growing weariness on the part of speculators tired of playing Micawber. The rise in rubber shares recorded last week has made little further progress. Rubber, the produce, keeps a shade above 1s. per lb. Base metal prices lead the share markets a lively dance and are mostly down on balance. The general tendency round Stock Exchange markets is distinctly heavy, and, as is usual in such circumstances, the volume of business, already contracted by holiday influences, has fallen off in noticeable measure.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Mar. 22.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	71/3	—	4 4 0
City of London	1	7½	7½	35/6	—	4 4 6
Clyde Valley	1	7	8	42/6	—6d.	3 15 5
County of London	1	10½	10½	50/-	+1/-	4 4 0
Edmundson's 7% Pref.	1	7	7	33/	+6d.	4 10 0
Do. Ord.	1	8	8	41/-	+2/-	3 18 1
Elec. Dis. Yorkshire	1	9	9	42/6	—	4 4 9
Elec. Fin. and Securities	1	12½	12½	2⅞	—	4 7 0
Elec. Supply Corporation	1	11	11	54/6	—	4 0 9
Lancs Light and Power	1	7½	7½	36/-	+6	4 3 6
Lond. Assoc. Electric	1	—	7	32/6	—	4 6 2
London Electric	1	7	8	35/6	−9d.	4 10 3
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	48/-	—	4 3 4
Midland Counties	1	7½	8	38/-	+1/-	4 4 3
Mid. Elec. Power	1	8	9	2 1/16	+⅛	4 7 6
North Eastern Electric Ordinary	1	6	7	34/1	+1/-	4 2 4
Do. 7% Pref.	1	7	7	34/-	—	4 2 4
Northampton	1	10	10	47/6	—	4 4 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	2½	+1/16	4 0 0
Do. do. 6% Pref.	½	6	6	29/6	—	4 1 4
Scottish Power	1	8	8	38/-	+6d.	4 4 3
South London	1	7	7	33/-	—	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	42/-	+6d.	3 16 2
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	112	—	4 9 3
Do. 1955–75	„	5	5	113	—	4 8 6
Do. 1951–73	„	4½	4½	106½	—	4 4 6
Do. 1963–93	„	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd.	„	—	2½	89½	—	2 15 10
London & Home Counties, 1955–75	„	4½	4½	110	—	4 1 10
London Passenger Transport, A.	„	—	4½	112½	—	4 0 0
Do. do. B.	„	—	5	119½	—	4 3 8
Do. do. C.	„	4½	4	90	—	4 9 0
West Midlands Joint Elec. 1948–68	„	—	5	112½	—	4 9 0
TELEGRAPH AND TELEPHONE						
American Tel. & Tel.	$160	9	9	173½	−5	5 3 9
Anglo-Am. Tel. Pref.	Stock	6	6	122	—	4 18 4
Do. Def.	„	1½	1½	28½	—	5 7 2
Cable & Wireless 5½% Pref.	„	4½	5½	111	—	4 19 1
Do. A. 7½% Ord.	„	Nil	Nil	29½	−½	—
Do. B. Ord.	„	Nil	Nil	9½	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	15½	—	2 18 0
Do. do. Pref.	10	6	6	13	—	4 12 4
Great Northern Tel.	10	20	20	42	−1½	4 15 3
Marconi-Marine	1	10	7½	1⅝	−1/16	4 5 9
Oriental Telephone Ord.	1	12*	12*	3 1/16	—	3 15 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	4/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	20½	−2	—
British Electric Traction Df. Ord.	„	5	5	475	−25	—
Do. do. Pref. Ord.	„	8	8	165	—	4 15 5
Brazil Traction	$100	—	70 cts.	26	−2	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	104½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	4½	−2	—
Do. 1st Bonds	$500	5	5	42½	—	—
Victoria Falls Ord.	1	20	12	72/6	—	3 6 3
West Riding	1	6½	10	46/3	−½	4 6 7
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	2⅝	—	5 9 1
Assoc. Elec. Ord.	1	6	8	52/-	−1/16	3 1 4
Do. Pref.	1	8	8	37/-	—	4 6 6
Babcock & Wilcox	1	8	8	2½	+1/9	3 4 0
British Aluminium Ord.	1	7½	7½	51/6	+3/6	2 18 3
British Insulated Ord.	Stock	20	20	6½	—	3 5 0
Brush Ord.	Stock	Nil	Nil	52½	−2	—
Callender's	1	15	15	4 5/8	—	3 5 9
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	12½	12½	70/-	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	3½	7	40/-	—	3 10 0
Enfield Cable Ord.	1	25	25	5 7/16	−1/16	4 12 0
English Electric	1	Nil	Nil	34/-	−1/-	—
Do. do. Pref.	1	6½	6½	24/-	−1/-	5 8 4
Ericsson Tel.	5/-	20	25	52/6	—	2 7 7
Ever Ready	5/-	35	35	31/6	−3d.	5 11 1
Ferranti Pref.	1	7	7	26/3	—	5 6 3
G.E.C. Pref.	1	6½	6½	31/3	—	4 3 2
Do. Ord.	1	10	15	88/-	+6d.	3 8 2
Henleys	5/-	30	30	20/3	—	3 14 1
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	48/3	−6d.	4 3 0
Lancashire Dynamo	1	10	20	3⅜	—	5 6 6
Siemens Ord.	1	5	6	35/-	—	3 8 7
Telegraph Construction	£1	Nil	7½	2½	—	3 6 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

14839. "A.c. voltage regulators." Ganz & Co., Ltd., and F. Ratkovszky. May 21st, 1935. (461696.)

17399. "Regenerative braking on electrically driven vehicles." A. W. Maley and E. M. Taunton. June 21st, 1935. (461881.)

23088. "Alternating-current systems for the supply of electric motors." English Electric Co., Ltd., and H. S. Carnegie. August 16th, 1935. (461886.)

23517. "Electron-discharge devices." H. E. Kallmann and O. Klemperer. August 21st, 1935. (461892.)

23578. "Electric wave-amplifying systems." British Tungsram Radio Works, Ltd., and J. H. Reyner. August 22nd, 1935. (461966.)

23618. "Signs comprising luminous electric discharge tubes." J. Foder and Pisagua Holdings, Ltd. August 22nd, 1935. (Cognate application 23619/35.) (462022.)

23657. "Moving-coil measuring instrument with booster magnet." Anglo-Swiss Industries, Ltd. (H. Muller). August 23rd, 1935. (Convention date not granted.) (462024.)

23670. "Systems of radio transmission and reception." D. M. Johnstone and Baird Television, Ltd. August 23rd, 1935. (461749.)

23678. "Insulation of electrical wires." J. Rohling and E. Kimenkowski. August 23rd, 1935. (461899.)

23732. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. August 23rd, 1935. (461751.)

23845. "Electric motor starting-switches or circuit-breakers." A. West & Co., Ltd., and F. J. Pavitt. August 26th, 1935. (461900.)

23869. "Surgical lamps." A. W. Parfitt. (Aperay Laboratories, Inc.) August 26th, 1935. (461977.)

23873. "Electric-discharge devices." British Thomson-Houston Co., Ltd. August 24th, 1934. (Cognate applications 23874/35 and 23875/35.) (462027.)

23939. "Electrical signalling systems." Associated Electric Laboratories, Inc. September 27th, 1934. (461982.)

23949. "Tell-tale device for telegraph printing apparatus." R. G. Griffith. August 27th, 1935. (461753.)

23957. "Radio receivers." L. R. Merdler and Baird Television, Ltd. August 27th, 1935. (461983.)

23982. "Regenerative control systems for electric traction motors." General Electric Co., Ltd., and E. P. Collett. August 27th, 1935. (461755.)

24043. "Electrical indicating or measuring instruments." J. Lucas, Ltd., and H. C. Taylor. August 28th, 1935. (461989.)

24067. "Electric relays." General Electric Co., Ltd., and F. Barrell. August 28th, 1935. (461817.)

24079. "Electric liquid-blast circuit-breakers." British Thomson-Houston Co., Ltd. August 24th, 1934. (461699.)

24192. "Electric-discharge tubes." C. Szegho, W. P. Anderson and Baird Television, Ltd. August 29th, 1935. (461999.)

24245. "Electric storage batteries." J. Lucas, Ltd., and G. D. Spencer. August 30th, 1935. (462004.)

24401. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., and A. J. Young. August 31th, 1935. (461907.)

24402. "Thermionic valves and circuit arrangements incorporating the same." Marconi's Wireless Telegraph Co., Ltd., G. F. Brett and G. M. Wright. August 31st, 1935. (Cognate application 2355/36.) (462035.)

24404. "Aerial feeder arrangements." Marconi's Wireless Telegraph Co., Ltd., and C. S. Franklin. August 31st, 1935. (462014.)

24405. "Direction-finding aerial systems." Marconi's Wireless Telegraph Co., Ltd., and S. B. Smith. August 31st, 1935. (462015.)

24410. "Electric motors." Allgemeine Elektricitats-Ges. September 1st, 1934. (462016.)

26386. "Selectivity control in radio receivers." E. K. Cole, Ltd., and H. Hunt. September 24th, 1935. (461910.)

26506. "Electric clocks." F. Hope-Jones. September 25th, 1935. (461703.)

26518. "Combined air-conditioner and electric-light fitting." H. Ashton. September 25th, 1935. (461911.)

26770. "Electric-lamp sockets." General Electric Co., Ltd., and F. G. Quance. September 27th, 1935. (461912.)

29054. "Mechanical time-lag relays applicable for example for electric switch operation." D. R. Davies, and Metropolitan-Vickers Electric Co., Ltd. October 21st, 1935. (461829.)

29534. "Receiving circuits for very short waves and vacuum tubes therefor." Standard Telephones & Cables, Ltd. November 24th, 1934. (461763.)

29783. "Fuse carriers for electric fuses of the cartridge type." Sykes & Dyson, Ltd., P. Sykes and F. J. Griffith. October 29th, 1935. (461920.)

30784. "Telephone systems." General Electric Co., Ltd., and B. F. Moss. November 7th, 1935. (461709.)

31149. "Electrical immersion heaters." General Electric Co., Ltd., and C. W. Stopford. November 11th, 1935. (461710.)

32644. "Electric condensers." British Thomson-Houston Co., Ltd. November 30th, 1934. (461834.)

33328. "Multiplex telegraphy." Western Union Telegraph Co. December 11th, 1934. (461769.)

34403. "Variable gear-ratio transmitting mechanisms." N. Wright, and Metropolitan-Vickers Electrical Co., Ltd. December 11th, 1935. (461934.)

35109. "Electric heating resistances." Dr. Ing Schott & Co. December 20th, 1934. (461936.)

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83. "Electrolytes for electric storage batteries." A. O. Nicholson. January 1st, 1936. (461836.)

4444. "Protective shields for electric welders." Schweizerische Unfallver-Sicherungsanstalt. July 26th, 1935. (461775.)

9443. "Electric multi-way plug-adaptors." A. P. Lundberg & Sons, Ltd., and G. Pegg. March 30th, 1936. (461783.)

11323. "Electric-arc converters." Allgemeine Elektricitats-Ges. April 18th, 1935. (461851.)

19545. "Electrical socket-connector members." Cinch Manufacturing Corporation. August 20th, 1935. (461863.)

20215. "Electric ovens provided with temperature-regulating devices." British Thomson-Houston Co., Ltd. July 24th, 1935. (461733.)

20862. "Mechanical movements particularly suitable for telegraph, signalling, and like selective systems and apparatus." V. Sims. August 31st, 1935. (Divided out of 24388/35.) (461864.)

22476. "Electric resonators of the transmission-line type." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1935. (461734.)

24129. "Electrically driven rollers for roller beds." F. Krupp Grusonwerk Akt-Ges. November 6th, 1935. (461736.)

28501. "Electro-mechanical aggregating apparatus particularly applicable to totalisators." J. Handley, C. Suckling, and R. H. Suckling. October 20th, 1936. (461804.)

29552. "Signalling systems using very short waves and vacuum tubes therefor." Standard Telephones & Cables, Ltd. November 24th, 1934. (Divided out of 461763.) (461807.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 17th:—

G.E.C. (lettering and design). No. 573866. Class 6. Electrical machinery and parts thereof. No. 573867. Class 8. Electrical instruments and apparatus. No. 573868. Class 13. Electrical fittings made of ordinary metal.—The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Osram. No. 574688. Osira. No. 574689. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes or in relation to the health of men or animals.—The General Electric Co., Ltd., address as in preceding note.

Imric. No. 566110. Class 8. Radio receiving sets, radio direction finding apparatus, and radio alarm apparatus.—The International Marine Radio Co., Ltd., Connaught House, Aldwych, W.C.2.

MR (lettering and design). No. 570071. Class 8. Storage batteries for use in connection with electric arc lamps for film production purposes.—Mole-Richardson (England), Ltd., 20, Chesham Place, Belgrave Square, Westminster, S.W.1.

Electric Relyon Clocks (lettering and design). No. 571465. Class 10. Electric clocks.—Synchro Time Systems, Ltd., Mexican House, Albion Street, King's Cross, N.1.

Sentry. No. 574520. Class 13. Electric irons, kettles and cooking utensils.—Wood, Russell & Co., Ltd., 34, Oxford Street, W.1.

Emptor. No. 575191. Class 13. Incandescent electric lamps (ordinary).—Galsworthy, Ltd., 21, Edward Street, Hampstead Road, N.W.1.

Vehicle Charging Plugs

A British standard specification for a vehicle-charging plug and socket rated at 150 V was published in 1929. Since that time large numbers of vehicles requiring smaller charging currents have come into use, and the specification has therefore now been extended by the inclusion of details of a plug and socket rated at 50 A, this being considered a convenient size for use on all vehicles up to about 30 cwt., or 65 A at the one-hour rating. In addition to providing for complete interchangeability, this new design incorporates a number of features. Facilities for earthing are provided, and there is a special contact for the operation of a relay to break the circuit when the battery is fully charged. The socket is intended for mounting on the dashboard of the vehicle, and a hinged lid over the socket is so arranged as to provide means for operating a switch to disconnect the lighting circuit during charging operations. Copies of this specification, No. 74-1937, can be obtained from the Publication Department of the British Standards Institution, 28, Victoria Street, London, S.W.1. The price is 2s. 2d. post free.

Mexican Electrical Development Regulations

The Mexican Government proposes in future to grant electricity generation, transmission, and distribution concessions only to Mexicans, or Mexican undertakings in which Mexican citizens predominate. The Ministry of National Economy is empowered by the decree to grant concessions or permits for the production and sale of electrical energy, but when it is intended to make use of water-power of national ownership for such generation the concession will be granted under the authority of the Ministry of Agriculture and Development. In the event of there being foreign associates in companies seeking concessions, they must renounce their nationality with respect to their interests in the latter. Moreover, concessions will be granted to companies having foreign associates only when native-born Mexicans are in the majority. Under equal circumstances preference in the granting of concessions will be given to semi-official companies and co-operative societies organised by the Federal Electrical Commission or the Ministry of National Economy. Concessions may not be granted for a period greater than fifty years.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alcester.—Premises, Swan Street, for the Industrial Co-operative Society, Evesham Street.

Bexhill-on-Sea.—Development of Bedwell estate; Chandos Investment Trust Co., Ltd.

Billingham-on-Tees.—Cinema, The Green; J. Clayton, architect, High Row, Darlington.

Birmingham.—Factory, Constitution Hill, for Ingledon & Sons; C. Bryant & Sons, builders, Whitmore Road, Birmingham. Nurses' home (£25,000), Lionel Street, for the Birmingham Eye Hospital, with electrical work; W. A. Harvey, architect, 5, Bennett's Hill. Extensions to the premises of A. Edmonds & Co., Ltd., Constitution Hill.

Blackburn.—Reconstruction of the Theatre Royal, Ainsworth Street, for the Northern Theatres Co., Ltd.; C. R. Cooper, architect, St. Mary's Place, Bury.

Bournemouth.—Police station (£41,963); borough engineer. Three schools for E.C. Garage and showrooms, Wimbourne Road; Commercial Vehicles (Bournemouth), Ltd.

Brighton.—Buildings, Black Rock, for Marine Parade Estates, Ltd. (£187,000); Gee, Walker & Slater, Ltd. Block of flats, Dyke Road; Westcombe Court (Brighton), Ltd. Flats (42) and shops, High Street, Rottingdean; Central London Property Trust, Ltd. Nine shops and flats, Rottingdean Cross Road (£15,256); borough engineer. Rebuilding, Special school, Hollingdean Road, for E.C.

Bury St. Edmund's.—Houses (53); H. Lister Coates, housing architect, 51a, Abbeygate Street.

Chelmsford.—Houses (50) and bungalows, Fryerning Lane, Ingatestone; A. E. Wiseman, architect, 10, Duke Street, Chelmsford.

Conisborough.—Houses (72); H. Thirlwall, U.D.C. surveyor.

Coventry.—Office block and service station, Radford works of the Daimler Co.; Higgs & Hill, builders, Lambeth Road, London, S.W.8. Two-storey buildings, Smithford Street, for the British Home Stores, Ltd., London; Fairweather & Co., builders, John Street, London, W.C.1. School, Wyken, for E.C.

Crewe.—School, Underwood Lane site (£25,923), for E.C.; education architect.

Croydon.—Baths, Woodside (£38,000); borough engineer. Stores, 38-42, South End; South Suburban Co-operative Society. Alterations to Scala Cinema, North End; Gaiety Picture House (Southampton), Ltd.

Dagenham.—Fire station (£18,346); U.D.C. surveyor.

Darlington.—Mill and extensions to No. 2 mill for the Rolling Mills Co., Ltd., Whessoe Road.

Dartford.—Houses, Princes Road; J. W. Ellingham, Ltd. Houses (85), Wentworth Drive; West Sussex Property Trust. Six shops, Mead Road; W. J. Draper & Son.

Dumbarton.—Aircraft factory, Denny's shipyard, for the Blackburn Aircraft, Ltd.; J. M. Monro & Son, 307, West George Street, Glasgow.

Failsworth.—Houses, Dean Street and Wrigley Head; U.D.C. engineer and surveyor.

Fort William.—Houses (32), Lochiel, for the relief of overcrowding in the burgh; burgh surveyor.

Gateshead-on-Tyne.—Houses (116), Old Fold; borough engineer.

Glamorganshire. — Schools, Gwauncaegurwen, Penclawdd, Kingsbridge and Reynoldstown, Gower, for County E.C.

Glasgow.—Houses, Anniesland Road and Lincoln Avenue and Provannill Road; T. Somers, burgh surveyor, City Chambers. Houses (200), Govanhill; housing director. Fire station, for the north-western district, for Corporation (£70,000); city architect. Store, Coxhill Street; H. James Aitken & Co. (Falkirk), Ltd. Extensions to the Yorkhill Royal Hospital for sick children.

Grangemouth.—Extensions (£42,000), for the Scottish Oils, Ltd.; the manager.

Halesowen.—Extensions to Blackheath Steam Laundry, Ltd., Park Street.

Hastings.—Houses (£10,764); G. W. Evans, Swansea, builders.

Hemsworth (NEAR PONTEFRACT).—Houses (60), Wortley No. 3 site; A. Wright, clerk, White Hall, Hemsworth.

Holmfirth.—Houses (24), Fieldhouse and Hinchliff Mill; J. Ainley, architect, Market Street, Huddersfield.

Irish Free State.—(LOUGHANURE, Co. DONEGAL).—Vocational school, for the County Vocational E.C., Ballyshannon; C. V. McLoughlin, architect, Letterkenny.

Kent.—School, Bexley (£21,767); county architect.

Kilbirnie.—Cinema, near Kilbirnie Cross; J. Henston, architect, Bridgend House, Kilbirnie.

Lancashire.—School clinic and child welfare centre, Haydock, also schools. Penketh, near Warrington, and Turton, for County E.C.; S. Wilkinson, county architect, County Offices. Preston.

Leadgate.—Houses (72), Ponthead, for the North-Eastern Housing Association; Cordingley and McIntyre, architects, The College, Durham.

Leicester.—Extensions to works, for J. H. Clarke & Co.

Leith.—Factory for the Scottish Co-operative Wholesale Society. Woodwork factory, opposite the Leith hospital; J. Miller & Partners, builders, Millar Place, Edinburgh. Transport garages, for the Scottish Co-operative Society, Ltd., 12, Links Place; Society's architects dept.

London.—(BRIXTON).—Extensions to Town hall (£83,400); Lambeth borough engineer. (CAMBERWELL).—Tenements (75), Rill Street (£44,150); L.C.C. architect. (ISLINGTON).—Tenements, Warltersville Road (£61,148); Gee, Walker & Slater, Ltd. (PADDINGTON).—Re-development of Oliver Mews area (£15,000); borough engineer. Theatre and shops, Westbourne Grove and Artesian Road; A. Mather, Leicester Square Chambers, Leicester Square, W.C.2. (POPLAR).—Buildings, Empire Wharf, Wharf Road; Simms (Builders), Ltd., 591, Commercial Road, E.1. Tenements, Dock Cottage area (£63,440); L.C.C. architect. Rebuilding factory, Dace Road; Safety Tread Syndicate, Ltd., Dace Road, E.3. (SHOREDITCH).—Extensions to Town hall (£36,927); borough engineer. (SOUTHWARK).—Rehousing, Comus Place area (£54,277); borough engineer. (BATTERSEA).—Cinema, Falcon Road; A. Mather, Leicester Square Chambers, Leicester Square, W.C.2. (BERMONDSEY).—Flats (67) and shops, Kipling Street (£51,111); borough engineer.

Lowestoft.—Houses, Enstone Road; D. E. Wells. Houses (46), Newson's Meadow (£16,350); borough engineer.

Luddenden Foot (YORKSHIRE).—Houses (20), Raw Pickle estate; F. Stockton, builder, Sowerby Bridge.

Manchester.—Buildings, Deansgate (£200,000), for Kendal Milne & Co. (Harrods), Ltd., Deansgate; J. W. Beaumont & Son, Danlee Buildings, Spring Gardens, Manchester.

Melksham.—Hospital (£39,698), for the Hospital trustees; F. Rendall & Sons, builders, Devizes.

Middlesbrough.—Offices, Borough Road, for the North-Eastern Daily Gazette, Ltd.; Stephen Easten, Ltd., builders, Milburn House, Newcastle-on-Tyne. Police station, Grange Road, &c.; borough engineer.

Monmouthshire.—School, Highcross, for County E.C.; C. L. Jones, architect, Newport.

Morpeth.—Houses (70), Lynemouth; Rigby and Appleton, builders, North Shields.

Nant Conway (NORTH WALES).—Houses (18), Dolwyddelen; R.D.C. surveyor, Rosehill Street, Conway.

Newbury.—Rebuilding, 83, Northbrook Street; F. O. Cooke, Extensions to store, Pound Street; H. James, Ltd.

Newcastle-on-Tyne.—Factory, Coast Road, for Quinn and Son; C. S. Errington, architect, 46, Grainger Street. Additions to nurses' home of the City Hospital; T. Curry and Sons, builders, Meldon Street.

Northern Ireland.—(DOWNPATRICK).—School, Saul Street; McCarthy and Lilburn, quantity surveyors. (LONDONDERRY).—Cinema (£35,000) for Ritz (Belfast), Ltd.

Oadby (LEICESTERSHIRE).—Cinema; F. H. Smith, Leicester, architect.

Oban.—Houses (64), Dalintart; H. S. Russell, Fort William.

Otley (YORKSHIRE).—Cinema, Roundgate, for the Union Cinema Co., Ltd.

Perth.—Houses (350), for the Perth and Kinross Council; burgh surveyor, City Chambers.

Preston.—School, Ribbleton, for E.C.; R. Williams, borough surveyor and engineer, Municipal Offices, Preston.

St. Helens.—Extensions to glass bottle works, for Forsters Glass Co., Ltd., Atlas Glass works, Pocket Nook; W. Peak, builder, Dutton Street, Warrington.

Selby.—Cinema, Gowthorpe Street; Parker, March and Charlton, architects.

Sheffield.—Factory, Rockingham Road, for M. Bernard & Co., Duracut works, Rockingham Street; E. Gardham, architect, Campo Chambers.

Southgate.—Houses (24), Waterfall Road; Davis Estates, Ltd.

Stockton-on-Tees.—Houses (8½-acre site), Norton Road, South Road, &c.; A. J. Blackett, builder, Greylands Avenue. Houses (162), Rudd's Land; G. P. Stainsby, architect. 25, High Street, Stockton-on-Tees. Houses (34), for V. C. Potts; F. W. Turnbull, architect, Carlton. Rebuilding after fire, the cinema, High Street; W. and T. R. Milburn, architects, 17, Fawcett Street.

Stourport.—Buildings for the Board of Governors, Hartlebury Grammar school.

Stratford-on-Avon.—Houses (32), Swincote estate (£11,980); G. W. Whateley and Sons, builders.

Stretford.—Houses (150), Lostock Hall estate, Barton Road; J. Maunders and Sons, builders, 21, Grange Avenue.

Sunderland.—Offices, workshops and stores, Bloomfield Street, for the Sunderland Engineering Equipment Co., Ltd.; W. and T. R. Milburn, architect, 17, Fawcett Street.

Taunton.—Houses (62), four sites; R.D.C. surveyor.

Thornton Heath.—Houses (41), Warwick Road; Wates, Ltd.

Tow Law.—Houses (60); U.D.C. surveyor.

Wakefield.—Houses (80), Belle Isle estate; J. P. Firth, architect, Barstow Square.

Wallsend-on-Tyne.—R.C. school, Willington Quay (£17,335); R. Burke, architect, Singleton House, Northumberland Street, Newcastle-on-Tyne.

Walsall.—Extensions to Satchwell and Gittings Tantarra Electric works.

West Hartlepool.—Houses, Stockton Road and Seaton Lane; borough engineer.

Worcestershire.—Nurses' home, &c., Hayley Green hospital; Folkes and Folkes, architects, 34, Hagley Road, Stourbridge.

Worsley.—Houses, Mountain Street and Granville Street; J. Howard, U.D.C. surveyor.

Yorkshire.—School, Rossington, for West Riding E.C.; county architect, Wakefield.